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# LECTURES ON SURGERY

BY JAMES SPENCE, F.R.S.E.,

SURGEON TO THE QUEEN IN SCOTLAND; PRESIDENT OF THE ROYAL COLLEGE  
OF SURGEONS, EDINBURGH; PROFESSOR OF SURGERY IN THE UNIVERSITY  
OF EDINBURGH; SURGEON TO THE ROYAL INFIRMARY AND LOCK  
HOSPITAL; CONSULTING SURGEON TO THE ROYAL HOSPITAL  
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## INTRODUCTORY NOTICE.



THE publication in Parts of the following Lectures has been adopted in order that the work might be available this Session for Students attending the Class of Surgery in the University ; as the publication of the remaining and more practical portions could not be accomplished at a sufficiently early date.



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# CONTENTS.



## LECTURE I.

Inflammation—Its Cardinal Symptoms—Its Local and Constitutional Phenomena and Manifestations—Sketch of the Progress of Inflammation as exhibited in Conjunctivitis, Sclerotitis, and Iritis—Examination of the composition of the Blood and the Functions of the Circulation in Healthy and Diseased action

Pages 1-7

## LECTURE II.

Inflammation continued—Acute and Chronic—The Terminations of Inflammation—Resolution—Treatment of Acute Inflammation—General Indications—Necessity for removal of Foreign Bodies from Wounds and Sores—Uses of Hot and Cold Applications—Other Local and Constitutional Remedies—Stimulants—Depressents—Diaphoretics—Diuretics—Evacuants—Deobstruents—Counter-Irritants—Chronic Inflammatory Action : its Treatment . . . . . 8-14

## LECTURE III.

Operations connected with the Treatment of Inflammation—General and Local Blood-letting—Venesection—Reasons for Choosing the Median Cephalic Vein—The Steps of the Operation described—The Closing of the Bleeding Orifice—Venesection of the External Jugular—Arteriotomy, where and how performed—Cupping and Leeching, their Relative Advantages—The Operation of Cupping described . . . . . 15-20

## LECTURE IV.

Suppuration—Pus, its Nature, Varieties, Microscopic Appearances, and Chemical Constitution—Theories as to the Origin of Pus—The Cellular and Molecular Theories Compared—Superficial Suppuration—Interstitial Suppuration or Abscess : Acute and Chronic ; Circumscribed ; Diffuse and Infiltrated Abscess Diagnosis—Treatment . . . . . 21-26



## LECTURE V.

Results of Inflammation continued—Chronic Interstitial Suppuration or Chronic Abscess—Diagnosis—Treatment—Question of Opening and Danger of Air entering considered—Sources of Irritative Fever—The Good and Bad Effects of Carbolic Acid in Treatment—Hectic Fever—Pyæmia . . . . . Pages 27-34

## LECTURE VI.

Local Dangers of Suppuration—From the tendency of Pus to point towards the Mucous or Integumentary Surfaces—From encroachment on important Structures—From involvement of Bones and Fascia.  
Sinus and Fistula—Causes which oppose successful Treatment—Treatment 35-42

## LECTURE VII.

Ulceration ; its nature and progress—Short sketch of the Healing Process—Healing by the first Intention : by Granulation—Opinions of the older Surgeons with regard to the Healing Process—More modern Views—General Classification of Ulcers—Ulcers of the first class—Those prevented from healing by defective action—The weak Ulcer : its character, progress, and treatment . . . . . 43-49

## LECTURE VIII.

Ulceration continued—The Callous Ulcer : its appearance, progress, and treatment—The second class of Ulcers—Those prevented from healing by excessive action—The Inflamed Ulcer : its characters, causes, and local and constitutional treatment . . . . . 50-55

## LECTURE IX.

Ulcers of the second class continued—The Irritable Ulcer : its characters, causes, and treatment—Ulcers of the third class—Those prevented from healing by peculiarity of action—General characters—The Constitutional Sore : its varieties, appearance, and treatment—The Serpiginous Ulcer : its treatment . . . . . 56-60

## LECTURE X.

Specific Ulcers continued—Lupus : its progress, appearance, and usual site ; its Treatment—Objection to the use of Nitric Acid—Importance of Treatment directed to the general health—The Scorbutic Ulcer : the conditions which precede and accompany it ; its Treatment almost entirely constitutional—The Varicose Ulcer . . . . . 61-66

## LECTURE XI.

Sloughing Phagedæna or Hospital Gangrene : its nature and varieties—Acute or Black Phagedæna : appearance and mode of development ; its rapidly destructive course ; the Febrile Condition which accompanies it—Grey Pultaceous Phagedæna : contrasted with the foregoing, both as regards its Local Appearance and Constitutional Symptoms—The causes of Phagedæna : Endemic, Epidemic—Practical hints and details with regard to Hospital Ventilation—Treatment of Phagedæna . . . . . Pages 67-73

## LECTURE XII.

Mortification or Gangrene : its phenomena, causes, and varieties—Acute or Humid Gangrene generally of traumatic origin : its symptoms and manifestations—Treatment must be regulated according to the cause—Question of Amputation in Traumatic Gangrene . . . . . 74-79

## LECTURE XIII.

Chronic or dry Gangrene : its causes and treatment—Senile Gangrene of Pott—Evils of former mode of Treatment by over-stimulation—The more rational mode now adopted—Gangrene arising from Ligature of a Vessel—General recapitulation of the question of Amputation in the different forms of Gangrene . . . . . 80-86

## LECTURE XIV.

Erysipelas : its symptoms and appearances—Idiopathic and Traumatic Erysipelas—Distinction between Erysipelas and Phlegmon—Erythema, Erythema erratic—Bilious Erysipelas—Phlegmonous Erysipelas—Œdematous Erysipelas—Erysipelas of the Head and Face—Origin, terminations, and prognosis 87-92

## LECTURE XV.

Treatment of Erysipelas : must be modified according to the case—General Indications—Antiphlogistic measures to be adopted only in certain forms of the disease—Uses of Iron : of Cold and Warmth—When and how incisions ought to be made . . . . . 93-98

## LECTURE XVI.

Furunculus or Boil—Nature of the affection : its progress—Pathology and Treatment—The Carbuncular Boil—Anthrax or Carbuncle : its appearance and the conditions which give rise to it—Local Treatment by free Crucial Incisions—Cautions—Constitutional Treatment . . . . . 99-106

## LECTURE XVII.

Definition of Tumour-growth—Distinction between Tumours and Hypertrophies ; between Inflammatory Swelling and Tumour-growth—Classification of Tumours : their separation into the two great divisions of Simple and Malignant—Simple Tumours : their vital manifestations, structural peculiarities, diagnosis, and history—Malignant Tumours : their characters, etc.

Pages 107-115

## LECTURE XVIII.

Special Simple Tumours—Simple Vascular Sarcoma : its nature and treatment—The Adipose or Fatty Tumour : its general characteristics and occasional peculiarities—Adenoid or Glandlike Tumours : their points of resemblance, structure, and history—Fibrous Tumours . . . . . 116-121

## LECTURE XIX.

Cystic Sarcoma—Encysted Tumours or Wens—Erectile Tumours or Nævi

122-126

## LECTURE XX.

Malignant Tumours—Brief outline of the varieties of Carcinoma, namely, Scirrhus, Colloid Cancer, and Epithelial Cancer—Characters, Causes, and Symptoms of Carcinoma : its diagnosis, prognosis, and treatment . . . . . 127-131

## LECTURE XXI.

Medullary Sarcoma or Soft Cancer : its external appearance, anatomical structure, growth, and degeneration ; the constitutional evidences of its existence—Melanosis or Black Cancer—Treatment of the various Forms of Medullary Sarcoma, Fibro-plastic or Recurrent Tumours—Cases illustrative of the distinction between Simple and Malignant recurrent Growths . . . . . 132-139

## LECTURE XXII.

Simple Tumours of Bone : their similarity to those of the soft parts—Exostosis : its structure, character, and treatment—Enchondroma : its appearance and limitation to the part in which it occurs—Osteosarcoma : its great resemblance to ordinary fibrous tumours—Case—Osteocystoma : analogous in its nature and progress to the ordinary fibro-cystic tumours ; treatment—Osteoma.

140-144

## LECTURE XXIII.

Malignant Tumours of Bone and their Analogues in the other Textures—Their Symptoms and Effects, Local and Constitutional—The Parts most liable to be attacked by them—The conditions under which Malignant Tumours may be modified anatomically, and how these should Influence our Treatment—Case—Osteoid Cancer . . . . . Pages 145-149

## LECTURE XXIV.

Syphilis, its meaning and modes of propagation—its division into primary, secondary, and tertiary—Primary Syphilis—outline of the characters, appearances, and symptoms of Hard and Soft Chancres—the treatment of each form  
150-158

## LECTURE XXV.

Secondary Syphilis—Bubo, Acute and Chronic—Syphilitic Sore Throat—Syphilitic Affections of the Skin—Papular, Pustular, Squamous, and Vesicular—Their Treatment . . . . . 159-167

## LECTURE XXVI.

Secondary Syphilis, continued—Condyloma and Warty Growths—Affections of the Lips and Tongue—Phymosis—Fissures and Contractions. Tertiary Syphilis—Tertiary Ulcers and Abscesses—Diseases of the Periosteum, Bone, and Cartilage—Treatment. Congenital Syphilis: its nature, symptoms, and treatment . . . . . 168-176

## LECTURE XXVII.

Wounds : their Nature and Classification—Incised Wounds : mode of Infliction : Appearance—The circumstances which modify or aggravate their Severity—Treatment of Incised Wounds—Arrestment of Hemorrhage—Cleanliness—Apposition of Severed Surfaces—Position of Part—Sutures—Local Applications—Danger of Undue Pressure—Regimen—Opiates—Rest . . . 177-183

## LECTURE XXVIII.

Punctured Wounds : their characteristics—The Special Dangers attending them such as—Erysipelatous Inflammation—Softening of the Muscles and Pyæmia—Treatment of Punctured Wounds—By rest—Application of Cold and Antiphlogistic Regimen—By Dilatation and Conversion into Incised Wounds—Contused and Lacerated Wounds ; definition and mode of infliction—Nature and treatment of Contusions—Lacerated Contused Wounds : how produced—Attended with great Destruction of Textures—Examples—Risks of Tetanus and Secondary Hemorrhage . . . . . 184-191

## LECTURE XXIX.

Treatment of Lacerated Wounds—Heat and Moisture—Poultices—Fomentations—The Tepid Bath—Question of Amputation—Poisoned Wounds : from Dissection ; from Dead Animal Matter—The Malignant Pustule of Butchers—From Rabid Animals—From the Bites of Insects and Snakes!

Pages 192-199

## LECTURE XXX.

Gunshot Wounds : Their Special Characteristics—Circumstances which regulate the Extent of Destruction attending them—Their Frequent Deviations from a Straight Course—Wounds inflicted by Small Shot—By Wadding—Superficial Injuries . . . . . 200-206

## LECTURE XXXI.

Wounds Inflicted by the Bursting of Fire-Arms—Their Treatment—General Treatment of Gunshot Injuries—Extraction of Balls and other Foreign Substances—Openings and Counter Openings—After Treatment—Risks of Secondary Hemorrhage—Prognosis—Cases . . . . . 207-213

## LECTURE XXXII.

Gunshot Injuries of Bones and Joints—Effects produced by a Ball on the Denser Portions of Bone, as compared with those produced on the Cancellated Texture—Special Risks attending on Injuries of Joints—Views of Dupuytren and Hennen regarding their Treatment—Excision *v.* Amputation—Special Advantages of Primary Excision—Statistics—General Rules for Amputation when necessary . . . . . 214-222

## LECTURE XXXIII.

Burns and Scalds—The Conditions which regulate their Severity, as regards the Constitution of the Patient, the Temperature of the Liquid or Metal, and the Site of the Injury—The Comparative Severity of Burns and Scalds—Shock—The more remote Constitutional Effects of these Injuries, as Congestion of the Lungs and Kidneys—Treatment—Amputation—General Remarks on Operations for Removal of Deformities . . . . . 223-231

## LECTURE XXXIV.

Tetanus, a Result of Wounds and Injuries—Time of its Invasion—Symptoms—Pathology—Treatment . . . . . 232-237

## EXPLANATION OF PLATES.



### INFLAMMATION.—PLATE I.—Page 2.

This plate is intended to illustrate the appearances exhibited in inflammation of the eye, in contrast with those seen in its natural condition. See Lecture i.

- Fig. 1. *Acute Conjunctivitis*. Stage of active congestion. Increased redness due to increased vascularity. The vessels of the conjunctiva obviously enlarged and arborescent.
- Fig. 2. *Chemosis*. The conjunctiva of an almost uniform red colour. Swollen, puckered, and pushed forward, owing to the passive congestion or stasis with effusion into the membrane and connective tissue between it and the sclerotic.
- Fig. 3. Healthy eye.
- Fig. 4. *Iritis*. Deep-seated inflammation of the eye. The appearance of vascularity is modified by the dense structure of the sclerotic. The zone round the cornea is due to the anatomical arrangement of the blood-vessels. The phenomenon of exudation is seen in the mass of effused lymph, situated on the pupillary margin of the iris.
- Fig. 5. *Corneitis*. Showing the modification of the appearances of inflammation in a non-vascular structure, there is neither redness nor vascularity in the cornea, but it has become opaque from exudation into its structure. See Lecture i. pp. 3-6.

### SUPPURATION.—PLATE II.—Page 22.

- Fig. 1. Acute diffuse abscess of arm and fore-arm, treated by openings and counter-openings. Drainage-tubes introduced so as to favour escape of discharge, and to facilitate the washing out of the cavity of the abscess.
- Fig. 2. Acute circumscribed abscess of fore-arm, pointing towards the surface. The form of the abscess shows the circumscription of the purulent collection, and the bright red colour shows the acute action in contrast with that of the chronic abscess.
- Fig. 4.
- Fig. 3. Chronic abscess of hip opened by the method described at page 30. (Sketched by Dr. John Smith.)



Fig. 4. Large chronic or cold abscess of upper part of thigh. From a case in the Royal Infirmary. (Sketched by Mr. Coughtrey.)

### MORTIFICATION.—PLATE III.—Page 74.

- Fig. 1. Traumatic gangrene of hand, caused by great violence ; mortification followed rapidly on the injury, and amputation was successfully performed at about the middle of the fore-arm, before the constitutional symptoms became severe. Case alluded to at page 77.
- Fig. 2. Dry senile gangrene of hand and fore-arm. The parts are seen dry and withered, whilst there is but little action above the line of demarcation. (Sketched by Dr. Richard Caton.)
- Fig. 3. Chronic gangrene arising from cold. The natural process of separation between the dead and the living parts is well shown. All the textures except the bone being divided at the upper line of demarcation. On the dorsal aspect of the foot in the tarsal region there is a deep line of demarcation, where nature had first attempted separation. The leg was amputated at some distance above the upper line of separation, so as to afford material for the formation of an efficient stump. See page 84.
- Fig. 4. Irritable senile gangrene of toes (Pott's gangrene). The mortified parts are more humid than in the dry senile gangrene. The neighbouring parts are swollen, red, and irritable.

### ERYSIPELAS.—PLATE IV.—Page 90.

- Fig. 1. Appearances characteristic of erysipelas of the head and face. The features and expression altered by the inflammatory swelling and effusion in the loose tissues, and by interference with the action of the muscles of expression. Small abscesses have formed in the eyelids, and vesications on the cheeks.
- Fig. 2. Erysipelas of leg and foot. Showing the diffuse character of the inflammatory redness. On the leg are seen vesications caused by the vessels of the skin relieving themselves by effusion between it and the cuticle. In the foot there is acute œdema owing to the effusion taking place most easily into the loose connective tissue of that region. (Sketched by Dr. John Smith.)

### TUMOURS.—PLATE V.—Page 112.

Exhibits contrasts between simple and malignant tumours.

The contrast in the physiognomy is the most obvious as shown in the painfully anxious and worn-out expression of the features in Fig. 2, as compared with the perfectly placid expression in the case of simple growth No. 1. Another point of contrast is the comparative want of definition in the malignant tumour, Fig. 2.

Fig. 1 is from a photograph of Mrs. Jepson, whose case is alluded to at p.



121. The tumour was sixteen years in attaining the bulk shown in the plate.

Fig. 2 is from a photograph of a patient who was under my care in the Royal Infirmary. In her case the tumour developed itself in less than eighteen months, and was attended with great pain.

#### TUMOURS.—PLATE VI.—Page 142.

Osteosarcomatous Tumour of Fore-arm, described at p. 142.

#### WOUNDS.—PLATE VII.—Page 184.

- Fig. 1. Sketch of a wounded soldier. The ball entered in the forehead, penetrated the skull and drove up the bone, elevating two portions at an angle. (From sketch by the late Sir Charles Bell. Finished oil-painting in Museum of Royal College of Surgeons, Edinburgh.)
- Fig. 2. Sketch showing the apparently eccentric course of a bullet. When the arm is extended it presents the appearance of having been penetrated by two separate balls instead of one. This is due to the position in which the arm was when wounded. That position is indicated by the dotted outline. The bullet entered the back of the wrist, came out at the front of the fore-arm, re-entered the front of the arm, and ultimately was lodged under the skin at the back of the upper arm—pp. 201-2.
- Fig. 3. Sketch showing nature of wound inflicted by a charge of small shot when fired close to the part. The aperture of entrance is small and well defined, not unlike that caused by a bullet. The aperture of exit is large and irregular, the textures being torn up by the shot, from the expansion of the charge in passing through them—pp. 203-4.
- Fig. 4. Sketch of penetrating bayonet wound, illustrating the appearance of punctured wounds in general. The form of wound is caused by the triangular shape of the weapon. The edges are slightly inverted, and so contracted by the elasticity of the skin as merely to represent three lines meeting in the centre. The darkness is caused by extravasation of blood under the integument. This wound penetrated the liver, diaphragm, and lung. The peculiar expression of face is the effect of these internal lesions. (From a patient, L'Hospital de la Charité, Paris, sketched by Dr. John Smith, Feb. 1850.)

#### WOUNDS.—PLATE VIII.—Page 214.

The sketches in this plate exhibit the immediate and secondary effects of gunshot wounds in the shaft of a long bone. (The specimens are in the Alcock Collection in the University of Edinburgh.)

- Fig. 1. Gunshot fracture of femur. The large and somewhat square opening marks the exit of the ball; whilst a longitudinal

fissure extends upwards from it, with transverse fissure lower down.

Fig. 2. Gunshot fracture of tibia. The aperture of entrance of the ball is shown. Longitudinal, transverse, and irregular fissures are seen extending from the wound in all directions, showing the extensive comminution in such cases.

Figs. 3 and 4 are different views of the same bone. They exhibit the abortive attempts at repair in a case of gunshot fracture of the femur. The extensive comminution and death of the comminuted fragments reveal the causes of failure. The limb required to be amputated fifty-three days after the injury.

#### WOUNDS.—PLATE IX.—Page 216.

Figures 1, 2, 3, and 4, exhibit the effects of bullet-wounds in the cancellated structure of the articular extremities of long bones.—See Lecture xxxii.

Fig. 1. Ball lodged in the articular end of humerus, at the junction of its head with the tuberosities, and splintering the bone into the shoulder-joint. An attempt was made to save the limb, but the patient died on the eleventh day. This is a typical case for primary excision.

Fig. 2. Elbow-joint in which the ball passed obliquely through the external condyle of humerus, not perceptibly fissuring the bone. Complete bony ankylosis took place, but a form of caries supervened. Amputation was necessitated 136 days after the injury. This is a beautiful specimen of the perforating wounds described by Dupuytren as proper cases for attempting to save the limb. It is one of a class I consider specially suitable for primary excision of the elbow. (Sketched by Dr. R. Caton.)

Fig. 3. Lower third of femur, showing a musket-ball lodged a little above the external condyle, just at the junction of the epiphysis. The wound does not implicate the articular surface. Primary amputation was performed. This is one of the cases suitable for extracting the ball, gouging out the surrounding cancellated texture, and trying to save the limb. (Sketched by Dr. R. Caton.)

Fig. 4. Is a similar injury in the head of the tibia. There was no shattering of the bone, but there was slight fissure of the articular surface; so that primary excision might be preferable in such a case. Amputation was performed eighteen hours after the injury.

Fig. 5. Thumb injured by the bursting of a fowling-piece. The clean defined lines of the divided skin were cut by the fragments of the gun-barrel, a mere touch of the knife being required to disarticulate the thumb.—Case referred to in Lecture xxxi. p. 208 (Sketched by Dr. R. Caton.)

## WOUNDS.—PLATE X.—Page 232.

- Fig. 1. A patient in the condition termed *Opisthotonos*. (From a sketch by the late Sir Charles Bell. The finished oil-painting is in the Museum of the Royal College of Surgeons.)
- Fig. 2. Diagram of the tepid bath treatment of lacerated or gun-shot wounds, or compound fractures; described in Lecture xxix. pp. 192, 193.
- Fig. 3. A case of tetanus, lately in the Royal Infirmary. It illustrates the peculiar expression of the features, and rigid contraction of the hand and arm, whilst the contracted state of the eyelids will correct the impression made by the widely-open eye in Sir C. Bell's sketch, as that condition is unusual. (From a sketch by Dr. John Smith.)



# LECTURES ON SURGERY.



## LECTURE I.

Inflammation—Its Cardinal Symptoms—Its Local and Constitutional Phenomena and Manifestations—Sketch of the Progress of Inflammation as exhibited in Conjunctivitis, Sclerotitis, and Iritis—Examination of the composition of the Blood and the Functions of the Circulation in Healthy and Diseased action.

GENTLEMEN—In commencing an exposition of the Principles and Practice of Surgery, the first form of diseased action which we require to investigate is inflammation, as, in one form or other, it complicates and modifies most diseases, injuries, and operations. The term Inflammation is purely conventional ; it is employed to denote the aggregate of a series of phenomena, and is best defined by simply stating what these phenomena are.

A part is said to be inflamed when it presents the following characters : REDNESS, HEAT, SWELLING, and PAIN. These are said to be the cardinal symptoms of inflammation ; no one of them is by itself sufficient to enable us to say that inflammation is present, but if they all exist together, even though some of them be not strongly marked, we may safely say that the part is inflamed. If these local signs or symptoms of inflammation continue, certain constitutional phenomena manifest themselves. The patient first feels chilly or even shivers ; the feeling of cold is soon succeeded by that of heat ; the skin becomes hot, harsh, and dry ; the pulse becomes quick, hard, and wiry—except in inflammation of the intestinal mucous membrane, when it is soft and compressible—the tongue at first is generally milk-white,

and gradually becomes furred and foul ; a bitter taste is felt ; the urine is scanty and high-coloured ; the bowels are generally constipated except when there is inflammation of the intestines—the nervous system is involved ; there is headache, intolerance of light and sound, and occasionally delirium. In a word, we have Inflammatory or Symptomatic Fever, so called because it results from the action of the inflamed part upon the system generally. This fever is characterised by undiminished vital power, increased vascular action, and diminished secretion and excretion.

I have in this way told you generally what are the local and the constitutional signs of inflammation ; let us now consider these more in detail. Returning to the consideration of the local affection, we observe that the early symptoms most marked, are redness and pain, the swelling being at first only slight and compressible. In the earlier stage the redness easily disappears on pressure, but as the action continues it becomes persistent and gradually assumes a deep crimson or lake tinge. The pain, at first of a hot, burning, and irritable character, becomes severe and throbbing, with sense of great tension. The swelling becomes unyielding, often hard and firm to the touch. These phenomena will vary according to certain conditions of the textures affected ; but I have described the typical form. In an inflamed limb some of these can be pretty well studied. In an organ such as the eye, however, where the structures affected are more or less transparent, we can actually trace the action through its different stages, and I now direct your attention to what we observe in a case of conjunctivitis, as I want you to know thoroughly the naked-eye appearances of an inflamed part before I speak of its microscopic characters. In inflammation of the conjunctiva there is at first a sense of irritation, as if some foreign body—such as dust or sand—were in the eye. Ere long the vessels of the membrane, which in the natural condition are invisible, become large and tortuous. This is the stage of active congestion. Vascular distension and engorgement increase ; the membrane becomes swollen, assumes a uniform red colour, the individual

INFLAMMATION.

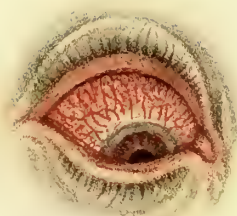


Fig. 1.

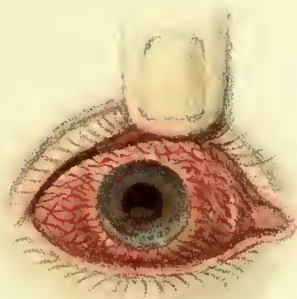


Fig. 2.



Fig. 3.

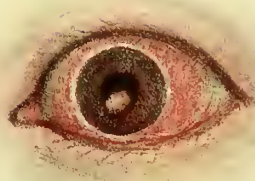


Fig. 4.

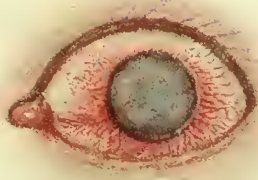
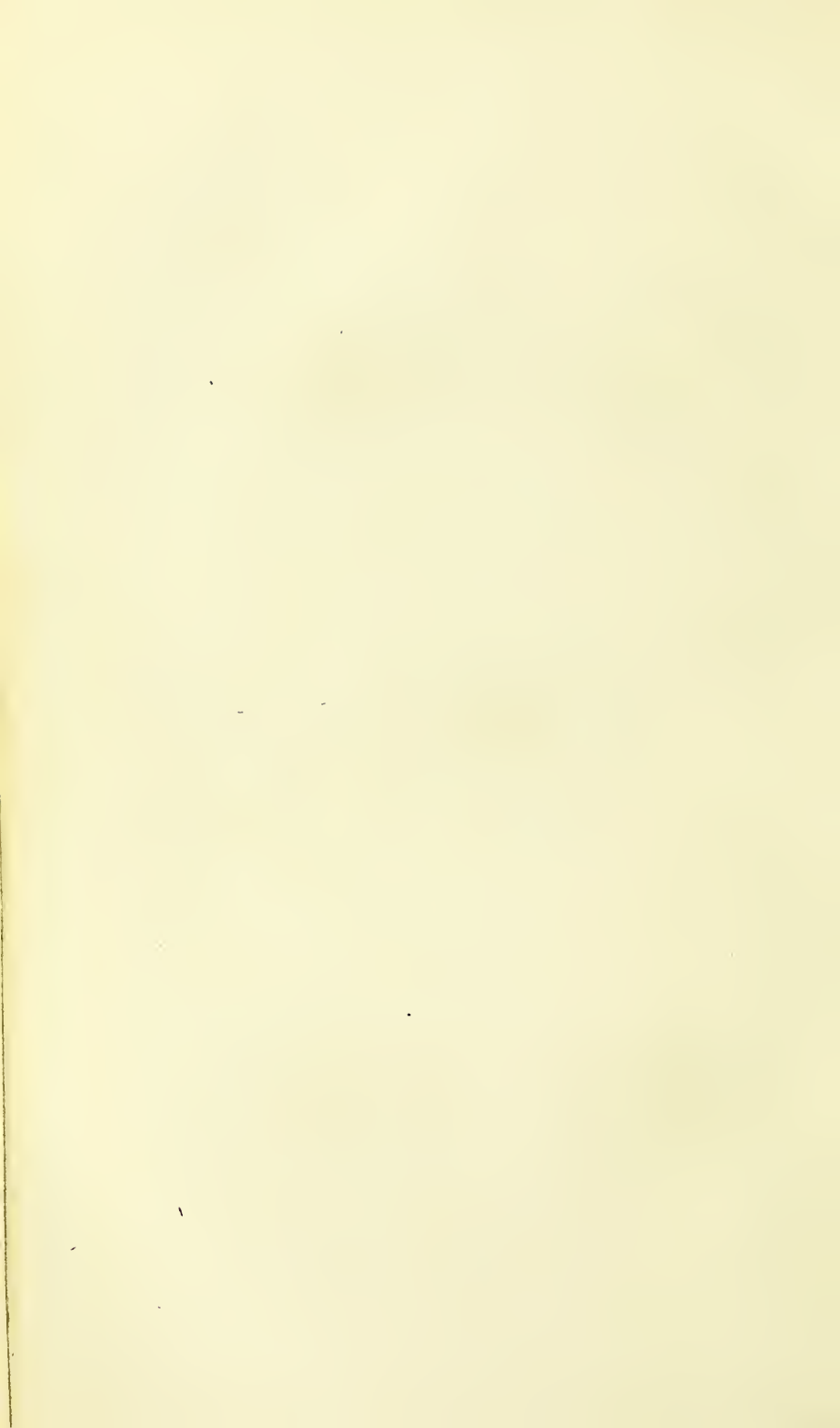


Fig. 5.





vessels disappear, and passive congestion with effusion takes place. This constitutes chemosis. Another condition termed ecchymosis, may take place from rupture of the over-distended vessels, and consequent extravasation of blood; and lastly, pus may form on the mucous surface. If the inflammation extend to the cornea, or if that structure be originally attacked, we see vascularity only at its margin and in the parts external to it, because the cornea possesses no vessels in its intimate structure; but we perceive a gradually-increasing opacity or cloudiness, due to a material which has exuded into its texture.

In inflammation of the sclerotic and deeper-seated parts of the eyeball, the pain is intense and accompanied with headache, the redness is of a pinkish hue, and less marked than it is in conjunctivitis, and the redness seems to terminate in a zone at a little distance from the cornea. These peculiarities depend not on any difference in the diseased action, but upon the density of the structure and the anatomical arrangement of its blood-vessels. When the inflammation extends to the iris, giving rise to the condition termed iritis, we have first contracted and then irregular pupil, appearances arising from the special functions of the structure; and here we have a good opportunity of observing one of the phenomena of the inflammatory process—namely the exudation poured out on the surface of the iris, and sometimes causing adhesion of its pupillary margin.

Having traced the phenomena as they can be observed by the naked eye, we may now proceed to consider the diseased action as it can be further studied with the aid of the microscope. Before, however, I speak of the microscopic appearances of an inflamed part, it is necessary to allude briefly to the functions of the circulation in health, in order that the junior student may be enabled more fully to understand the diseased action.

The blood is composed of two portions, one fluid—the liquor sanguinis, consisting of fibrin and serum—the other solid—the blood discs or corpuscles, of which there are two kinds, the yellow and the white. If we examine a transparent membrane, such as the bat's wing or web of the frog's foot, by means of a microscope,

we see the blood flowing through the capillaries and smaller arteries and veins ; we see that the yellow blood-corpuscles move rapidly along in the central part of the vessel, while on either side and close to its walls is a clear space filled with liquor sanguinis, with here and there a white corpuscle, moving much more slowly than the yellow corpuscles do ; this is termed the lymph space, and here the blood flows more slowly. The fluid part of the blood is that chiefly concerned in nutrition ; it contains in solution the nutritive elements, and is absorbed by the various textures. Nutrition is carried on entirely in the spaces between the capillaries by means of these vessels, which consist of a single thin coat, through which the nutritive material can easily pass. Every tissue has an inherent power of attracting and selecting from the blood those constituents best suited for its own nutrition. Bone selects more phosphates from the blood than the other textures ; the liver selects materials to form bile, and the kidney those to form urine. This power, exerted by all the textures, is a very important one in maintaining the circulation. By it arterial blood is attracted towards the tissues, hence it is termed the *vis a fronte*, in contradistinction to the power exerted by the heart and the elastic coats of the arteries, which is called *vis a tergo*. To the attractive force of the various tissues is due the local determination of blood which occurs in inflammation. When we irritate the web of a frog's foot by some stimulus—such as a drop of acetic acid or a little mustard—inflammation is induced, and we can observe under the microscope the changes which take place. The vessels at first contract, and the current of blood through them is more rapid. They then gradually dilate, but the current, though slackened in speed, still passes through them more rapidly than in the normal state, because the *vis a fronte* is increased by the irritation ; the blood therefore now flows in larger quantity, and with increased rapidity, constituting what is known as *determination of blood to the part*. This is the stage of *Active Congestion*. It corresponds to that condition of the inflamed eye characterised by florid vascular arborescence. The vessels continue dilated, but

the blood soon begins to flow with diminished rapidity ; it then moves to and fro—that is, it oseillates ; and finally comes to a complete standstill, stagnation, or stasis. This is the stage of *Passive Congestion*. In the normal state of the eirculation you can distinguish the individual corpuseles in the moving blood ; when complete stasis occurs, however, the outlines of the corpuseles can no longer be recognised, and the capillaries are filled with a semi-fluid gelatinous red mass. Soon after stagnation has taken place the intervaseular spaces become clouded with a fluid of a pale straw colour. By many this fluid is supposed to be the liquor sanguinis which has oozed out of the vessels, and it is in consequence termed the *Exudation*. By others, however, it is supposed that this fluid is actually formed by the tissues outside the vessels. These changes may all be seen in the field of the microscope at one time ; some regard them as concurrent phenomena, but I believe that they follow in regular sequence—each resulting from the one which preceeded it.

Various explanations have been offered as to the proximate causes of inflammation. Macartney supposed that irritation of the organic nerves of a part constituted the first cause of active congestion. Others have supposed that all the changes must be ascribed to the effect of the irritant upon the ultimate tissues. According to some, the vital activity of the tissues is diminished ; according to others, it is increased, but at the same time perverted. Professor Bennett supposes that in inflammation the power of selection possessed by the tissues is lowered, while their power of attraction is so increased that they attract the liquor sanguinis itself from the vessels, which in this way constitutes the exudation. Though it is probable that the so-called exudation is derived from the vessels, it is nevertheless maintained by Virchow and others that it is formed from the inflamed tissue itself. According to Virchow, a fluid similar to the liquor sanguinis is being constantly formed as the result of vital changes in the tissues. This fluid is conveyed to the blood by the lymphatics. If the tissue be irritated, and this fluid produced in

such quantity that the lymphatics are unequal to the task of conveying it away, it accumulates in the inflamed part.

I must say, however, that I do not think that the rapid formation of the plastic exudation, as we see it in acute peritonitis arising from injury, could be easily accounted for on the supposition that it is derived from an increased action of the epithelium lining the membrane, or from its connective tissue. The theory that this fluid oozes directly out of the bloodvessels is, I believe, a more correct one. But whatever be its source, this exudation is always present either in the neighbourhood or in the substance of an inflamed part. It is this abnormal exudation, which, by altering structure and interfering with natural functions, leads to organic change. This is well seen in the case of the inflamed cornea. The exuded material, furnished by the capillaries at the margin of the cornea, gradually occupies the branching spaces—which form channels of nutrition in the corneal substance—and produces opacity.

Having thus described to you the phenomena, both as observed by the naked eye and microscope, you will now be in a position to understand the causes of these phenomena. The redness is obviously due to an increased amount of blood in the vessels of the part ; the increased heat is chiefly produced in the same way, but more rapid oxidation of texture and molecular change in the inflamed part assist. The pain is referable at first probably to the impression made on the organic nerves which accompany the vessels, but in the advanced stages it is apparently due to direct irritation of the sensory nerves themselves by the swollen vessels, and subsequently by the pressure of the swollen textures. The swelling is due to the distension of the vessels and the exudation. The great question now comes to be, "What causes the stagnation of the blood?" for this is regarded by most authors as the point of departure from healthy action. Boerhaave founded his theory of inflammation upon an observation of Loewenhöck, who supposed he had discovered, by means of the microscope, three different sizes of blood-corpuscles, and inferred that there were different sets of capillaries to suit, and that in

the normal state of affairs the small corpuscles passed through the small capillaries, and the large corpuscles through capillaries of corresponding size. Boerhaave supposed that stagnation was produced by a large corpuscle getting by mistake into a small vessel, blocking it up, and so producing obstruction; hence his famous theory entitled "error loci"—a theory which held its ground till improved microscopes showed that no such divisions of corpuscles exist, and that the smallest capillary will allow the largest corpuscle to pass through it. Thus the assumed anatomical fact was found to be an error, and this should teach us to be very guarded when we speak of facts.

Cullen tried to explain the stagnation as due to a supposed "spasm of the extreme vessels, leading to irregular circulation."

Sir Charles Bell, however, long ago pointed out that whatever either irritated or impaired the vitality of the vascular wall tended to arrest the flow of the blood, even in the larger vessels. Hence in the irritated condition of the extravascular texture, we find a ready explanation of the phenomenon of stasis.

We now merely notice the remote causes of inflammation. These are either predisposing or exciting; among the former are epidemic and endemic influences, and certain conditions of the constitution, such as scrofula, plethora, and exhaustion. Among the direct exciting causes are any unnatural stimulus, such as a puncture or sting, the application of acrid substances, wounds, exposure to heat or cold, and the like.



## LECTURE II.

Inflammation continued—Acute and Chronic—The Terminations of Inflammation—Resolution—Treatment of Acute Inflammation—General Indications—Necessity for removal of Foreign Bodies from Wounds and Sores—Uses of Hot and Cold Applications—Other Local and Constitutional Remedies—Stimulants—Depressants—Diaphoretics—Diuretics—Evacuants—Deobstruents—Counter-Irritants—Chronic Inflammatory Action : its Treatment.

INFLAMMATION may be acute or chronic. In the acute the disease runs its course more rapidly and with greater violence than in the chronic form. Acute inflammation may become chronic, and the chronic may become acute, or I would rather say sub-acute. Though the symptoms of chronic inflammation are less violent than those which accompany the acute, the former is, nevertheless, often more dangerous, inasmuch as the process is more insidious, and the alterations of texture which result are frequently of a permanent character.

The febrile symptoms which I have already described to you as those which accompany acute inflammation of a sthenic type, constitute what is termed inflammatory or symptomatic fever. A variety of this fever, termed Irritative, is met with in erysipelas, and in connection with inflammation in certain constitutions and conditions. Its chief features, besides those I have mentioned of a general character, are a quick pulse, feeble from the first ; a foul tongue, tending to become brown and dry ; low muttering delirium. It may be described generally as a fever of the asthenic type.

The TERMINATIONS of inflammation are various ; it may end in resolution—fibrous formation—pulpiness—friability or consolidation of texture—suppuration—ulceration—gangrene or sloughing. The most favourable termination, and that which we try to



obtain, is resolution—a condition in which the increased vascularity, pain, and tension disappear, and the exudation becomes absorbed, the part returning to its natural condition, or nearly so. This may be seen in many cases of conjunctivitis when actively treated; and may also be well studied in cases of orchitis or inflamed testicle. Sometimes, on the termination of inflammatory action in one part, it reappears in another: this is termed metastasis. This is sometimes seen in erysipelas, where the inflammation may cease in the skin—the part originally affected—and reappear in a mucous membrane or elsewhere. It is merely a change of the disease from one place to another, and therefore cannot be considered a termination of inflammation. We shall consider the other terminations—such as suppuration and ulceration, in due time.

We now proceed to discuss the *treatment* of acute inflammation with the view of procuring *resolution*. The General Indications are—1st. To remove the cause; 2d. To moderate excessive vascular action, and to relieve the congested capillaries; 3d. To restore such natural secretions as have either been diminished or altogether arrested; 4th. To produce disintegration and absorption of the exudation; and lastly, in certain cases, more especially of chronic inflammation, to create metastasis, by exciting inflammation in a less important part.

If any foreign body, or other source of irritation, be present, it must be removed at once, for even though its removal may not altogether arrest the diseased action, its presence tends to keep it up, and will prevent its successful treatment. Vascular action may be diminished by lessening the irritation which gives rise to it. This may be done by giving opiates internally, or by anodyne fomentations. Hot or cold applications are frequently used. In regard to the application of heat or cold in local inflammations, you may very naturally ask what rules are to guide you in prescribing such apparently opposite remedies; and, in point of fact, the answer is not quite so easy to give in words as might be expected from the familiar way in which we speak of those remedies. I be-

lieve the choice of hot or cold applications is a matter of tact and experience. It is true we try to explain their *modus operandi* by saying that cold allays irritation of the part, and moderates excessive vascular action by causing vital contraction of the vessels, so limiting inflammation to the minimum; and that heat acts by soothing the nerves and relaxing the vessels and tissues, so that the vessels more easily relieve themselves by effusion. But the great question is, in what conditions does the one or other of these remedies act beneficially? What indications has the surgeon which of them to prescribe? My own experience leads me to believe that the benefit of cold applications is limited to a comparatively short period of the inflammatory process—viz. excited action, and perhaps active congestion of a part—and is chiefly useful as preventing or modifying the subsequent phenomena. Heat, on the other hand, in the form of tepid applications such as lint dipped in lukewarm water answers better, and is more soothing when inflammation is fully established; and I have especially noticed this in great wounds, in which, if cold be continued beyond six or eight hours, uneasiness, increased pain, and a low form of local inflammation are induced, whereas a change to tepid applications soothes, removes redness and swelling, and favours the healing process.

We can relieve the congested capillaries directly by local depletion, or indirectly by diminishing the force of the heart, while we at the same time do what we can to allay local irritation. We can readily deplete some inflamed parts by making an incision into them; the incision, in addition to relieving the distended blood-vessels, permits the pent-up exudation to escape, and so diminishes tension. In some cases, instead of bleeding the inflamed part itself, we draw blood from a neighbouring part, whose vessels directly communicate with it. In conjunctivitis, for example, if blood be taken from the anterior branch of the temporal artery, we find that the vessels of the conjunctiva are emptied, and the part begins, under the bleeding, to assume its normal appearance. This form of depletion may, however, affect the inflammation in another way; it may cause faintness, and

in this way lessen the *vis a tergo* by depressing the action of the heart. This, however, is merely a temporary effect, and the disease may become as bad as ever when reaction occurs. But by depletion we gain ground, and we should therefore endeavour to keep up its effect. With this view we give medicines which lessen the force and frequency of the heart's action—counter-stimulants—such as tartar-emetic, along with an opiate ; or, when we want to avoid nausea, small doses of aconite. When there is a hard and quick pulse, hot dry skin, scanty urine, and constipation, we must endeavour to restore and even to increase the secretions of the skin, kidney, and intestinal tract. To act on the skin we have recourse to remedies termed diaphoretics, such as the eighth of a grain of tartar-emetic, combined with a quarter to half-a-grain of opium, every four hours ; in certain cases tartar-emetic is contra-indicated, and the opiate, either given by itself, or combined with two grains of ipecacuan, may be substituted ; the liquor ammoniæ acetatis is also useful as a stimulating diaphoretic. To act on the kidney we have recourse to medicines termed diuretics. We must be cautious in the use of stimulating diuretics, such as sweet spirits of nitre, lest we over-excite the kidney, and increase the congestion of that organ. Acetate of potass, in doses of ten or fifteen grains, or small doses of sweet spirits of nitre, largely diluted, and simple cooling drinks, are our best remedies of this class. To stimulate the alvine secretions, and remove the constipation, we prescribe purgatives, which require to be varied according to circumstances. For example, in some cases we employ hydragogue cathartics to procure rapidly copious watery evacuations ; in other cases, where there are biliary symptoms, the use of alterative purgatives, such as mercurials, is indicated. During the active stage of inflammation, with its concomitant fever, the patient's diet requires to be carefully regulated ; animal food should as a general rule be avoided, and the patient put upon a nutritious non-stimulating diet, consisting of milk and farinaceous food. Wine and all stimulants are contra-indicated in this stage, except under peculiar circumstances. To procure disintegration and absorption of the exuda-

tion, we have recourse to what are termed deobstruent remedies. Among the more valuable of these are mereurials and iodine given internally, and tincture of iodine, blisters, and pressure applied locally. The *modus operandi* of these remedies is obscure ; but though we do not certainly know how they act, we use them because experience has shown their good effects ; they seem to stimulate the part to action, and cause the exudation to be disintegrated, to re-enter the venous capillaries and be excreted. In cases of swelled testicle, for example, when acute action has entirely ceased, and where some induration exists, the application of iodine, or some stimulating preparation of ammonia, causes the swelling to disappear rapidly ; this was formerly supposed to be due to increased activity of the absorbents, but it is now believed that the remedy causes disintegration and elimination of the exudation. The application of a bandage in certain cases to a swelled part, and the introduction of a bougie, in cases of stricture, act as deobstruents by the pressure and consequent stimulation they produce. The action of internal remedies as deobstruents is still more difficult to explain, but the effect produced is often quite evident ; for instance in iritis, where there is effusion of lymph on the edges of the iris, when mercurials are given internally the lymph speedily disappears. Another remedy employed is artificial metastasis or counter-irritation ; the principle of which is to determine the diseased action to a less important part, and thereby relieve the organ originally affected. Thus, in inflammation of deep-seated bones and joints, the use of counter-irritation is followed by marked relief. This mode of treatment is most beneficial in subacute or chronic inflammation. The principal counter-irritants used in surgery are blisters, rube-facients, setons, and the cautery.

In order to bring the treatment before you as a whole, let us take the example of inflammation of the eye, since we have already used it to illustrate the pathology. In the first stage of conjunctivitis we make use of cold applications, such as lint or rag soaked in cold water laid over the eye. When the active congestion is well marked with passive congestion

at some points, the acetate of lead and opium lotion, or a decoction of camomile and opium, is applied. We cannot, however, trust to these measures alone, so we deplete from the anterior branch of the temporal artery, from the angular vein of the eye, or by leeches; and then give small doses of tartar-emetic and opium, which keep down the excited action and also act as diaphoretics. These measures, conjoined with the use of purgatives, are all that is required in most cases. Scarifications are sometimes employed, but they are apt to cause too much irritation. In the chronic state, blisters on the temple produce great benefit. In the further stages of the disease different treatment must be adopted. Should there be chemosis or projection of the swollen conjunctiva over the cornea, this requires that membrane to be snipped, lest by pressure it should interfere with the vitality of the cornea. Subsequently warm fomentations are applied, which may be changed after a little to tepid or cold dressings. In sclerotitis there is often a specific condition present—viz. rheumatism or syphilis—and this must be kept in mind in treating the disease. Here, as in conjunctivitis, we have recourse to depletion, and we treat the specific condition by exhibiting colchicum or iodide of potassium, whilst cold local applications should be avoided. Alterative doses of mercury, followed by a saline, may often be given with advantage. In iritis, besides the general treatment already alluded to, we employ a specific remedy to prevent contraction of the pupil—viz. belladonna, or a solution of atropia in glycerine, rubbed over the eyebrow or around the eyelids. To get rid of the effused lymph we give mercury, which acts almost like a charm in causing it to disappear. In all cases of inflammation it is important that the inflamed part should be kept at rest, so that in the case of the eye the organ should be protected from light and other sources of irritation. The diet and regimen must be strictly antiphlogistic.

CHRONIC INFLAMMATORY ACTION.—When inflammation is chronic, the symptoms are negative rather than positive; there is no violent action; the vascularity is but little marked; there



is uneasiness rather than positive pain. The rise in the pulse is but slight, and there is no great constitutional disturbance. In chronic inflammation of certain important organs there are febrile symptoms present, more especially at night ; there is a feeling of lassitude, the palms of the hands are hot, with slight headache or uneasiness. Then there is restlessness at night, and perspiration takes place towards the morning. The pulse is more accelerated in the morning and in the evening than through the day. We must bear in mind that, though the symptoms are less marked than in acute inflammation, important alterations in structure are taking place insidiously, and we must therefore not be deceived by the apparent mildness of the malady.

TREATMENT.—In chronic inflammation depletion is contra-indicated : instead of lowering the circulation, our object is to stimulate it, both locally and generally. In chronic conjunctivitis, for example, we use stimulants and astringents, such as solutions of nitrate of silver, sulphate of copper, and sulphate of zinc, to get rid of the passive congestion. The use of blisters, or other form of counter-irritation, also the employment of deobstruent and alterative remedies, are specially indicated. To combat the low form of febrile action, and support the general strength, we have recourse to preparations of bark, chalybeate tonics, and generous diet.

The formation of white fibrous tissue is a frequent result of inflammation, and leads to thickening and consolidation. It is a very common result of inflammation of serous membranes, such as the pleura and pericardium. In synovial membranes likewise this termination is sometimes met with, and it frequently results from chronic inflammation of the submucous tissue, where it gives rise to thickening, which, in the case of canals, such as the urethra, rectum, and œsophagus, produces stricture of these passages.

## LECTURE III.

Operations connected with the Treatment of Inflammation—General and Local Blood-letting—Venesection—Reasons for Choosing the Median Cephalic Vein—The Steps of the Operation described—The Closing of the Bleeding Orifice—Venesection of the External Jugular—Arteriotomy, where and how performed—Cupping and Leeching, their Relative Advantages—The Operation of Cupping described.

GENERAL depletion, or blood-letting, may be effected by opening either a vein or an artery, and these two modes are respectively named venesection and arteriotomy.

VENESECTION is the operation more generally practised ; and the vein usually selected is one or other of those situated at the bend of the arm, or the external jugular. Of the veins at the bend of the arm, we prefer to open either the median basilic or the median cephalic, for these are not only larger in size, but are more fixed in position than are the lateral basilic and cephalic. If a vein be not fixed in its place it is liable to roll about under the skin ; and should this displacement occur during the operation, blood would escape into the cellular tissue, and there become formed into a sanguineous tumour or thrombus. In selecting a vein on which to operate, it is also necessary to bear in mind its anatomical relations to the artery, otherwise both may be wounded. The median basilic vein overlies the brachial artery at the bend of the arm ; and although more superficial, and separated from the artery by a strong aponeurosis, yet if the operation be performed carelessly, or if the patient give a sudden start, the lancet may penetrate the fascia and the artery beyond. For this reason, I generally prefer to open the median cephalic, it being separated from the

line of the artery, and of a sufficient size to afford a good stream of blood.

Having decided on the vein to be opened, we first place a bandage, tied with a slip-knot, round the arm, above the point where the opening is to be made. This serves to obstruct the current of blood returning to the heart, and causes the vein to distend. We then draw the thumb of the left hand upwards over the course of the vein, and press on it just below the part where it is to be opened. We next push the point of the lancet into the distended vein until resistance ceases, or until we see blood; then move the blade so as to make an oblique opening in the vein, and divide the skin more largely than the vessel. It is necessary that the wound be oblique; for if it be longitudinal the blood does not flow readily, and if transverse the vein may be cut completely across. The incision in the skin ought to be larger than the opening in the vein, otherwise some blood may find a lodgment under the skin, and thus give rise to the condition termed thrombus, already alluded to. When the blood flows sluggishly, we desire the patient to move his fingers while grasping in his hand a piece of wood or other firm substance. This causes compression of the deeper veins, and so produces in those more superficial an increased flow of blood. The amount of blood to be abstracted must be regulated by the effect produced on the circulation and the extent to which depletion is indicated. When we wish to stop the bleeding, the fillet must be removed; but, before doing so, the thumb should be placed on the bleeding orifice. Thereafter, the arm being placed in a bent position, a compress of lint should be applied on the wound, and retained in that position by means of a figure-of-8 bandage. The arm should then be supported in a sling.

Venesection of the external jugular is sometimes performed. It is had recourse to in certain cases of croup in young children, and apoplexy in adults, and often affords great relief. It is also useful in cases accompanied with venous congestion of the great vessels of the head or chest. The operation can be per-



formed very readily, and the point at which the opening should be made is just where the vein lies upon the sterno-mastoid muscle, for there it is more fixed and more superficial than at any other part of its course. The external jugular, however, is not quite superficial like the median cephalic and basilic veins; it is covered by the platysma-myoides muscle, and for that reason it must be opened in a different way from the veins at the bend of the arm. If opened by one cut in a line oblique to its own course, but parallel to the fibres of the platysma, these, by their position, would prevent a free exit to the blood, and thereby give rise to the danger of extravasation and thrombus. The opening in the skin should be made with the edge of the lancet obliquely to the course of the vein, and then the fibres of muscle divided transversely before opening the vein, so that they, by contracting, may cause the wound to gape and thereby secure a wide external opening. The other steps of the operation are similar to those already described. The vein should be compressed by means of the finger or thumb above the clavicle, and below the point where you intend to enter the lancet. This is necessary in order not only to make the vein rise, but also to prevent the entrance of air into it, which circumstance, if it occurred, might be attended with a fatal result. The vein should then be opened obliquely as we have already indicated. When a sufficient quantity of blood has been withdrawn, the flow should be arrested by means of a pad of lint placed over the wound, and retained in that position by strips of adhesive plaster. These serve the purpose better than a circular bandage round the neck, as they are less liable to occasion congestion. In restless patients—as children—the pad may be kept on by means of a bandage passing obliquely over the neck, and tied under the opposite armpit. Venesection of the jugular vein is popularly regarded as being a very formidable operation—people speak of opening the great jugular with feelings of dread. This is, however, unwarranted apprehension, for the bleeding is not more difficult to arrest here than in the arm.

ARTERIOTOMY is now performed only on the anterior branch of the temporal artery, and chiefly for affections of the eye. The temporal artery, though apparently superficial, is covered by a layer of dense fascia which prevents you from reaching the vessel so readily as you might expect. The arteries are not uniformly dilated as are the veins ; and as the vessel should be in a state of dilatation when the opening is to be made through its coats, we endeavour to attain this by compressing it on the distal side of the intended opening. When the vessel is thus distended, we cut down upon it with the edge of the lancet. Having thus laid it bare, we make an oblique opening into it with the point of the instrument. We must take care not to make a transverse opening, for by so doing, we would be very likely to cut the artery completely through. An unexhausted cupping-glass may be placed over the opening for the sake of cleanliness, and to prevent spiriting of the blood. When about to arrest the flow, the artery should be cut completely through, its coats will then contract and retract, and the bleeding will cease. A compress and bandage should be applied, the bandage twisted firmly over the pad and tied under the chin. Should there be any difficulty in arresting the flow of blood by compression, you should tie the cut ends of the vessel, or secure them by means of acupressure. Do not attempt to draw off the blood by means of an *exhausted* cupping-glass, for the edges of the glass would press on the artery, and thereby completely arrest the flow of blood.

PUNCTURES, SCARIFICATIONS, and INCISIONS, are sometimes had recourse to as means of local depletion ; and if our object be simply to draw blood, without seeking to effect relief of tension, the incisions need not be made deeper than the skin ; but generally we make the incisions sufficiently deep to permit the escape of serum, or other effusions, so as to relieve tension of the parts affected.

CUPPING and LEECHING are other methods of bloodletting. Leeching is a favourite mode, but leeches cannot always be obtained, and, when obtainable, they have the disadvantage of being less certain in their action, and the flow of blood which follows

their use is somewhat difficult to estimate or regulate. If, however, leeches are to be applied, the surface should first be well washed with warm water. When they drop off, a warm sponge should be held to the part to encourage the flow of blood. If the bleeding from a leech-bite threatens to be troublesome, it may be arrested by taking a small needle and transfixing the wound, then tying a thread round it.

CUPPING is the more convenient mode of depletion ; it is very beneficial in certain cases, such as acute affections of the joints.

The operation consists in placing an exhausted glass cup over a number of scarifications made by an instrument designed for the purpose. The scarificator consists of a metallic box, with slits corresponding to a dozen revolving lancets contained within it ; these, when at rest, are concealed from the view, but, on touching a spring on the side of the instrument, they are made to perform an instantaneous revolution, and, in doing so, each point projects for a certain distance through a narrow slit in the case ; and if the scarificator be placed against the surface of the body and the trigger pressed, each lancet makes a corresponding incision through the skin. Then a cupping glass, which resembles a small tumbler, is exhausted of air by means of a spirit-lamp, and placed over these incisions, and the blood is rapidly drawn into it by means of suction.

Before the incisions are made, the part should be well warmed, and an exhausted cup applied so as to determine the blood to the surface. The scarificator should then be "set" so as thereby to determine the depth of the scarifications. By placing the instrument on half-cock, you will at once see the length to which each point will project when in action, and you must be guided in adjusting them by the stoutness or leanness of your patient, and the part of the body on which you are to operate. Be careful to follow a middle course. Do not make the incisions too deep, lest you penetrate the cellular tissue, and so cause the blood to flow into it, nor too shallow, or but little blood will come, nor

into the adipose tissue, or it will project through the openings and plug them.

After the incisions are made, the cupping-glass previously heated should be held over the scarified part, with the one edge resting on the skin, and the other raised about an inch and a-half from it ; a spirit flame is then held for a second or two within the raised edge of the glass, and when withdrawn, the glass pressed firmly on the skin, so as to prevent the entrance of cold air. The glass must not be exhausted too much, or the pressure exerted by the rim against the skin will prevent the blood from flowing towards the incisions.

The quantity of blood drawn must always be regulated by the circumstances of the individual case, and the degree to which the circulation is affected by the operation.

You have now to learn how to remove the glass when it is sufficiently filled, and this apparently simple proceeding requires the exercise of tact and neatness, otherwise the blood will be spilt, and cause unnecessary trouble.

You should place a folded towel just below the under edge of the glass. Then insinuate the nail of your fore-finger beneath the upper edge of the glass to loosen it, while, with the other hand, you hold the lower part of its rim pressed against the skin, so that the blood necessarily falls into the cup without being spilt, being directed towards it by a sponge used by your free hand. After emptying the glass it can be re-applied, if necessary.

But as all these operations can be more easily demonstrated than described, I shall now proceed to show you the different steps of the process on the dead body before us.

After sufficient blood has been drawn, the wounds should be closed with adhesive plaster.

## LECTURE IV.

Suppuration—Pus, its Nature, Varieties, Microscopic Appearances, and Chemical Constitution—Theories as to the Origin of Pus—The Cellular and Molecular Theories Compared—Superficial Suppuration—Interstitial Suppuration or Abscess : Acute and Chronic ; Circumscribed ; Diffuse and Infiltrated Abscess  
Diagnosis—Treatment.

ONE of the most common terminations of inflammation is that termed SUPPURATION. A fluid is formed during this process to which the older surgeons gave the name of pus, because they imagined that it resulted from putrefaction of the textures implicated in the diseased action. Healthy or “laudable” pus, is a pale yellow-coloured fluid of the consistency of cream, though somewhat more tenacious. According to some curious investigators it has a sweet and mawkish taste, and it is bland and unirritating ; it has a peculiar heavy, somewhat sickly odour. A second form of pus is known as serous, curdy, flaky, or scrofulous. It is thin, like whey, and is mixed with flakes of broken-down lymph, or perhaps coagulated albumen ; such pus indicates a low, weak condition of the system. It is generally found in chronic abscesses. A third form of pus is termed sanious, grumous, or bloody. It is thin, and of a brownish-red colour, and is generally secreted by irritable or unhealthy surfaces. A fourth variety of pus is termed ichor. This is a thin irritating fluid of a disagreeable odour. An example of it is seen in the discharge from malignant or specific sores, such as cancer. Under the microscope, pus is seen to consist of nucleated cells floating in a liquid termed the liquor puris. Each pus-cell is about the 1-3000th of an inch in diameter—globular—slightly irregular on the surface, like a mulberry ; when acetic acid is added to it, it causes the cell to distend and the cell-wall to become very transparent, while



it brings into view the nucleus, which usually consists of three granules adhering one to another. Pus-cells closely resemble mucus corpuscles and the white-blood corpuscles. Chemically, pus consists of fat, albumen, globulin, and salts. Its specific gravity varies from 1021 to 1041 ; on heating, the albumen is coagulated. A solution of caustic potash converts it into a thick, tenacious fluid. This agent may be used as a test to distinguish pus from mucus, for while it renders pus more tenacious it renders mucus more fluid.

Much discussion has taken place regarding the origin of pus-corpuscles. Two theories are now held as to their development ; one is termed the molecular, and the other the cellular theory. According to the molecular theory, pus-cells, and indeed many other morbid cells, are formed by the aggregation of molecules of the fibrin of the exudation. According to the cellular theory, pus-corpuscles, like all other cells, are derived from pre-existing cells. This theory has undergone a considerable modification since it was first propounded. It has become a nuclear as well as a cellular theory, and its upholders now maintain that all cells are derived from other cells or nuclei. The most common seat of the formation of pus is in areolar tissue ; and the cellular or nuclear theorists suppose the nuclei of the connective tissue—connective tissue corpuscles as they are termed—to be the parents of the pus-cells.

The process of suppuration is either *superficial* or *interstitial*: the former occurs from a wounded or abraded surface, or from a mucous membrane even when its surface is entire, as seen in conjunctivitis and gonorrhœa. Interstitial suppuration takes place in the interior of organs, and gives rise to collections of pus termed abscesses.

SUPERFICIAL SUPPURATION takes place in all wounds which do not heal by a rapid union of the cut surfaces—union by the first intention as it is called. The surface of the wound assumes a greyish or dirty-orange colour, the margins become purple and swollen, and a thin serous or viscid exudation appears on its surface. If the wound be large, inflammatory fever sets in ; the

SUPPURATION.

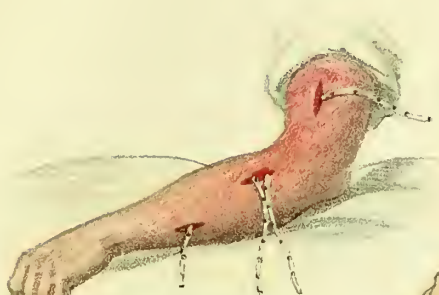


Fig. 1.



Fig. 2.



Fig. 3.

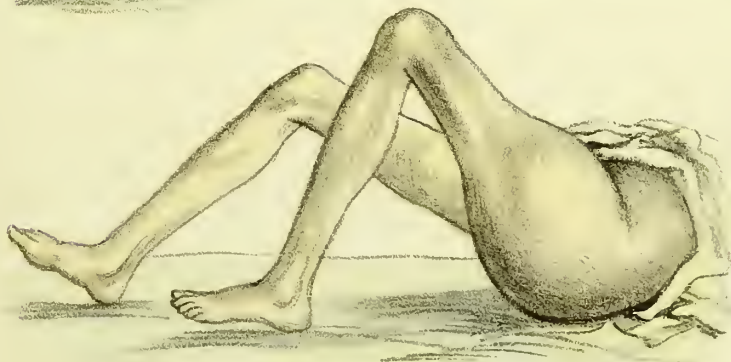


Fig. 4.





margins of the wound become red, tense, and everted ; the patient has a chill or a rigor ; and when this occurs, we infer that suppuration is about to take place. Then the edges become more everted, pus is formed and thrown off freely, the pain begins to abate, and the symptomatic fever declines. Though the wound still retains a slightly purplish colour, the tension, redness, and hardness, diminish. The symptomatic fever was formerly considered to be caused by pus circulating in the blood. This idea, however, has been abandoned. The alleviation of the constitutional symptoms is due to the relief of the local congestion and tension.

IN INTERSTITIAL SUPPURATION or ABSCESS the fever and rigor occur as in superficial suppuration ; but when the pus has formed, no relief is obtained—the pain and tension are in fact increased, for here the purulent matter is confined, and gives rise to increased tension and pain. Abscess occurs in two forms—the *acute* and *chronic*. The acute form is divided into *circumscribed*, *diffused*, and *infiltrated*.

IN CIRCUMSCRIBED ACUTE ABSCESS the ordinary symptoms of acute inflammation precede the suppuration ; the pain and tension increase, inflammatory fever supervenes, the colour of the part changes to first a bright red and then a purplish hue, and when the abscess is deeply situated, there is acute oedema of the superimposed cellular tissue. The hardness increases from the exudation which is thrown out. Succeeding these symptoms we have a distinct chill or rigor, indicating incipient suppuration. In the centre or focus of the diseased action pus is formed, and around this is a layer of condensed plastic material forming a hard boundary : this has been called the cyst of the abscess. As the suppuration goes on, the lymph decreases in quantity and density. The purulent fluid, by its presence, causes absorption of the plastic matter, and tends to point towards one or other of the free surfaces of the body—the cutaneous or the mucous ; generally the former. If situated near the surface there is redness and swelling, with a hard resisting portion around the abscess. If the abscess be left untouched, it

will at length burst, and the pus be evacuated, but it is dangerous to leave it alone, especially if deep-seated, for the pus will destroy important textures in making its way to the surface. An abscess under the vasti muscles of the thigh, for example, may, if left to itself, ulcerate into the synovial membrane of the knee-joint; in like manner, an abscess in the neck may point towards and open through the mucous membrane of the pharynx. One of the surest diagnostics of pus having formed is the feeling of *fluctuation*; the sensation of a fluid moving when pressure is made lightly with the finger on an abscess, if there is any quantity of pus present. In feeling for fluctuation, we should place lightly the points of the fingers of one hand upon the dependent part of the abscess, whilst with the fingers of the other hand we tap or press gently on the upper part of the swelling at the same time; this causes the fluid, if it be present, to impinge on the fingers at the lower part, and communicate a feeling of undulation. Care must be taken not to place the opposed hands too close to each other, as elasticity of the structures may in that case simulate the sensation of fluctuation. It is very important to make out this feeling of fluctuation before making an opening, for some tumours are apt to be mistaken for abscesses, and the treatment in the two cases is quite different. Still, in some cases, as in whitlow or in deep-seated abscesses in the neck or perineum, it is better to make an early incision than to wait for distinct fluctuation, or run the risk of the pus burrowing and thereby endangering important structures.

In the *Treatment* of acute abscess, apply remedies which will tend to favour the formation of pus—namely, heat and moisture; and this should be done both in superficial and deep-seated abscesses. For this purpose, hot fomentations, warm poultices, and warm water lint, are used. If the pain be great, anodyne fomentations may be employed, also sedatives, as opium, given internally to procure rest at night. As soon as matter has formed, sometimes even before it has fairly formed, a free incision should be made into the abscess, so that the pus may be permitted to escape readily, and then a soft poultice should be

applied for twenty-four or forty-eight hours. The poultice should not, however, be continued too long, as it may give rise to weak action in the cavity of the abscess. Afterwards, slips of lint dipped in warm water are applied in the form of a many-tailed bandage, so as to cause a moderate amount of pressure on the walls of the cavity and thereby promote absorption. After a few days, slightly stimulating lotions are applied to the wound. The lotion may consist of one grain of sulphate of zinc dissolved in an ounce of water, or a weak solution of chlorinated soda. In the treatment of abscesses, the position of the patient is very important ; he should be so placed that the opening may be free and as dependent as possible, in order to allow the matter to escape readily.

**DIFFUSE ACUTE ABSCESS**—This is a form of abscess where, although some lymph is thrown out, yet the purulent matter is diffused through the surrounding textures from the anatomical disposition of the part—as when suppuration occurs under the fascia lata of the thigh, or deep fascia of the arm ; in such a case the pus may spread right round the limb. In opening such an abscess a free incision should be made towards its outer and lower part, but this may not in every position of the patient be the most dependent part, and hence a free vent will not always be given for the escape of the matter ; we must therefore make a counter-opening at a point opposite the first, and some distance from it. If the abscess be very large, three incisions are sometimes required. A piece of caoutchouc tubing—the wall of which is riddled with holes—may then be introduced to permit of free drainage of the abscess and to keep it open : this, moreover, enables us to wash out the cavity of the abscess. We afterwards apply warm water lint and a light bandage, leaving the openings uncovered. Under this treatment you will generally find that these abscesses, though usually rather large, heal very readily.

**INFILTRATED SUPPURATION**, sometimes also termed Diffuse Cellular Infiltration, generally occurs as the result of erysipelatous inflammation. The pus is not healthy, but thin and acrid, and possesses destructive properties independent of the bad

effects produced by its pressure. There is no fluctuation, but the finger sinks into the skin, and leaves a dimple ; hence we say there is bogginess or pitting on pressure. The subcutaneous, and even the intermuscular cellular tissue, become infiltrated with pus, and the whole limb assumes a dusky red and swollen aspect. The local symptoms of acute abscess are present, but the accompanying fever is of the irritative type, and the pulse is quick, small, and compressible.

In the *Treatment* of infiltrated suppuration we first apply warm and anodyne fomentations, then make incisions early. Here the pus is infiltrated into the spaces of the cellular or areolar tissue, and one or two incisions are therefore not sufficient, we require to make a number of small incisions about an inch or an inch and a half in length, and then the matter oozes out slowly. Dress the part afterwards with warm-water lint and a many-tailed bandage. Sometimes the incisions must be made through the deep fascia to allow pus infiltrated through the intermuscular cellular tissue to escape. Iron and other tonics must be given to keep up the patient's strength, and appropriate nutrient diet should be given ; for sloughing is more apt to occur in this than in any other form of suppuration.

## LECTURE V.

Results of Inflammation continued—Chronic Interstitial Suppuration or Chronic Abscess—Diagnosis—Treatment—Question of Opening and Danger of Air entering considered—Sources of Irritative Fever—The Good and Bad Effects of Carbolic Acid in Treatment—Hectic Fever—Pyæmia.

IN CHRONIC INTERSTITIAL SUPPURATION or Chronic Abscess the symptoms are much less marked, and proceed more slowly than in the acute abscess. There is little or no pain felt, and the swelling, which is often the first indication of the collection, is colourless. There is no increase in temperature, and hence the name of cold abscess has been given to it as opposed to the acute abscess, where the temperature undergoes a marked increase. The progress of the diseased action is very slow. Constitutional symptoms may or may not be present. On the surface of the abscess we sometimes find swollen veins, as in certain tumours. The pus which flows from a chronic abscess, on its being opened, is of variable character—sometimes of a creamy consistence, very often thin and whey-like, with flaky masses ; but it is never really homogeneous, for there is always some of the flaky matter in the cavity of the abscess. This form of suppuration generally occurs in patients of a strumous or scrofulous diathesis, and is often connected with diseases of bones and joints. The abscess is lined by a peculiar cyst-like membrane, the inner surface of which is villous or granular. As this is the source of the pus, it is termed the pyogenic membrane. The diagnosis of chronic abscess is not always easy. It is sometimes difficult to distinguish it from certain tumours, such as fatty or medullary. In these tumours there is a feeling of elasticity almost amounting to fluctuation, and there are large veins on the surface just as in chronic abscess. In both chronic abscess and medullary sarcoma the patient has a sort of sallow complexion,



so that great care is needed to arrive at a correct diagnosis ; and it is most important that a correct diagnosis should be formed, for the treatment of chronic abscess is very different from that of some tumours. Should a fatty tumour be mistaken for a chronic abscess, and an incision made into it, no great harm is done, for the tumour can be excised then and there ; but if this be done in a case of medullary sarcoma, the incision will cause the tumour to grow with increased rapidity, and the fatal results will be precipitated.

There is considerable difference of opinion as to the *Treatment* of this form of abscess—some surgeons hold that it should be opened like an ordinary acute abscess, while others maintain a different opinion. In many cases we avoid opening a chronic abscess, if it be large, for there may be no pain or constitutional disturbance ; while, if opened, irritative fever may be set up, which often proves fatal. There are cases, however, in which we are justified in interfering—namely, those in which the abscess is quite circumscribed, and when it is not connected directly with any joint or large cavity. When the abscess communicates with a joint, we should delay opening it as long as possible ; though, when pain and constitutional disturbance supervene, we may sometimes open the abscess in order to give the patient relief from suffering, and afford him the only chance of recovery.

The bad symptoms which generally supervene on opening a chronic abscess are these ; the patient complains of general uneasiness, shivering followed by pain and heat over the whole body, the skin becomes hot and dry, the urine is scanty and high-coloured, and the bowels generally constipated ; there is nausea and vomiting ; the pulse is quick—from 120 to 130—small and compressible ; the patient has a sunk appearance, and the tongue becomes dry and furred—in a word, he has irritative fever. The frequency with which this fever follows the opening of chronic abscesses deters many surgeons from opening them at all. The late Mr. Abernethy supposed that these bad symptoms were due to the entrance of air into the cavity of the abscess. He

thought that the pyogenic membrane became inflamed in this way and decomposed, and that this set up the irritative fever. He therefore recommended a small valvular opening; the skin over the abscess was drawn up and the opening made; the skin was then allowed to retract, and the result was that the openings in the skin and in the deeper parts did not correspond, and so no air could enter the cavity. In my own practice I sometimes use the exhausting syringe, which prevents the entrance of air; but, at the same time, I believe that the irritative fever which results is due to the decomposition of the contents of the abscess. By making a small opening in it with an ordinary abscess-lancet or trocar, we do not empty the cavity completely, we only draw off the thin part of the pus; the thick curdy matter—the vitality of which is exceedingly low—is left behind, and this, as well as the blood which is poured out into the cavity after removal of the thinner pus, decomposes; noxious gases, such as sulphuretted hydrogen, are evolved; and I believe that it is to the absorption of these putrid matters, and not to the entrance of the air, that the irritative fever is due; for even when opened in such a way that no air could enter I have seen the cavity of the abscess refill and irritative fever ensue, whilst all the bad symptoms have disappeared on the abscess being laid freely open. I have so frequently seen the best results follow the free opening of such abscesses, that I cannot but think that where we do open them, a free incision to permit the ready escape of noxious matters is less to be dreaded than the pent-up putrescence which so often follows a small opening. When a chronic abscess is not connected with a joint or internal cavity, it may be opened without much hesitation. The wall of the cavity should then be painted with tincture of iodine, which seems to possess antipyogenic qualities and to induce a healthier action in the part. Sometimes we require to make a counter-opening and introduce some drainage-tubing, to enable us to wash out the cavity and inject appropriate lotions into the abscess.

A chronic abscess communicating with a diseased joint is much more dangerous, and it is very doubtful whether we should open it, as irritative fever, exhausting discharge, with hectic, are

almost certain to supervene. Chronic abscess near diseased hip-joint, however, may sometimes be opened with advantage. In this case, or in abscess connected with the great serous cavities, the exhausting syringe should be used to draw off the pus, not so much to prevent air entering, into the cavity of the abscess as into the cavity with which it is connected. Afterwards apply a compress and bandage over the part. Another method of preventing the entrance of air is to open the abscess by a trocar and canula, to which is fitted a stop-cock and a piece of india-rubber tubing. The free end of the tubing is immersed in water, and in this way no air can enter the abscess. Should irritative fever set in, after the pus has been drawn off in this manner, we must make a free incision into the abscess, and then apply warm-water dressings, followed, after a time, by some stimulating lotion, either on the surface or injected into the cavity. Besides the local treatment, the state of the constitution must be attended to. The patient's strength must be supported by nutritious and slightly stimulating diet.

Another mode of treating large or chronic abscesses has come into fashion lately, and seems to have been followed in some quarters with good results. It is called the carbolic acid method, and consists in using that substance in such a way as to render its presence a barrier against all putrefactive agencies.

The prescribed mode of use is as follows :—You take one part of the acid and mix with three parts of linseed-oil ; you then take a piece of lint and saturate it freely with the mixture. This you lay flatly on the swelling. Thereafter you raise the one side gently, so as to obtain room for making an incision into the abscess, taking care to replace it immediately afterwards, and allowing the contents of the abscess to escape through or underneath the lint. Finally, you cover up the portion of lint which overlies the opening with a piece of tinfoil which has been previously covered with a thickish layer of carbolic acid paste, then the whole must be retained in position by strips of adhesive plaster.

Carbolic acid is supposed to be fatally destructive to those innumerable invisible germs which are said to infest the atmo-



sphere, and which are by some regarded as the cause of all the evils which follow on wounds and operations. Whenever, therefore, one of these living organisms—real or ideal—or a spore of one of them, approaches a wound which has been treated in the manner I have described, it dies, and thus, the cause of all the evil being destroyed, no harm can arise from its presence in the opened abscess.

As to the correctness of the theory there is very great room for doubt, but as to its practical results I can speak from my own experience, and it so happens that this has been considerable, for lately I have had to treat an unusual number of chronic abscesses and cases of compound fracture in my wards in the Infirmary, and in all these this method has been employed. Well, of nine cases of chronic abscess so treated, the notes of which I hold in my hand, secondary suppuration in the cavity of the abscess has not been completely checked in a single instance, and in many of them, as you may have seen, irritative fever has followed just as it does when they are treated in the ordinary way—neither better nor worse. The treatment of compound fracture has, in my hands, been attended with similar results, except indeed that the irritation in the wound seems greater than where no such means are used. Nevertheless, I will give it a further trial, because, although I do not expect such magical results as others seem to have obtained, yet I know from my own past experience that carbolic acid is most useful as an antiseptic. Some five years ago I made use of carbolic acid freely—on the recommendation of Dr. Crompton of Manchester—for foul sores, with great benefit, and subsequently I tried it in several cases of amputation as an antiseptic application to the surfaces of the flaps, but I gave it up as I found that tincture of iodine answered better. I believe that carbolic acid is really valuable as an antiseptic dressing, but I fear that, like many other excellent things, it will suffer from over-laudation. In this way many remedies fall out of use entirely. They are found wanting in the virtues with which enthusiasm invests them, and thus we lose the benefit of the real good they might effect.

The dangers accompanying suppuration, whether in the acute or chronic form, are of two kinds—*constitutional* and *local*.

The CONSTITUTIONAL DANGERS are the liability to three forms of fever—the *Irritative*, of which I have already spoken, *Hectic*, and *Pyæmia*.

HECTIC FEVER either succeeds the irritative fever, or occurs when the discharge of pus is profuse or long-continued. During the day the patient feels comparatively well, but towards evening the skin becomes hot, the pulse rises, and he complains of weariness and lassitude ; while at night the symptoms are much more intense, aching pains are felt all over the body, and, after a feverish slumber, the patient awakes in the morning covered with perspiration. The cheeks are flushed, but the rest of the face is pale. The rapidity and compressibility of the pulse increase. The patient gradually grows weaker, and often dies from exhaustion. Hectic fever used to be considered as an intermittent fever, but it is really more of the remittent type, because, during the intervals between the attacks—that is, during the day—the patient is never perfectly well. In irritative fever the secretions are arrested, but in hectic the urine is often increased in quantity, and may be loaded with urates ; whilst, if perspiration be checked, diarrhoea generally comes on. Sometimes, however, it does so while the perspiration continues. This is a very bad sign, and generally precedes the fatal issue.

The treatment of hectic fever consists in getting rid of the source of irritation and of the discharge, and in supporting the patient's strength as much as possible by tonics—iron, wine, cod-liver oil, and nourishing diet. If the disease depends on some affection of internal organs, we can only palliate the symptoms, as we cannot remove the source of the irritation, which lies beyond our reach.

PYÆMIA is another of the constitutional dangers. It is generally met with in connection with deep-seated suppuration, and after operations and severe injuries. When pyæmia is about to supervene upon an operation or injury, the pulse keeps high. Indeed, if the pulse do not fall below 100 after three or

four days, we may suspect something wrong. The disease is usually ushered in by marked symptoms, the most prominent of which are not, however, always the first to appear: they are, restlessness; dry tongue, the breath has a smell of new-made hay, and—what is a most important symptom—the skin, especially by the side of the nose and about the eyebrows, becomes yellow. These less-marked symptoms may exist for two or three weeks before pyæmia decidedly sets in, then there will be a rigor, at first perhaps not oftener than once in the twenty-four hours. In the interval the patient feels well, or merely complains of what he considers rheumatic pains in some of his joints; but soon the rigors become much more frequent, and are followed by profuse perspiration. The peculiar odour of the breath becomes more marked; the pulse rises very high; the skin assumes a general yellow tinge; pain is felt over the liver; bronchitis supervenes, and vomiting of dark-coloured matter, and delirium, soon herald a fatal issue. After death, abscesses are usually found in the liver and lungs, sometimes in the larger joints.

It was formerly supposed that this condition was due to absorption of pus, and to its circulation in the blood, hence the term—pyæmia. This theory is now, however, abandoned, for the injection of healthy pus into the circulation is not found to give rise to the symptoms I have described. They seem, however, to be due to some ichorous matter either developed there or absorbed from the wound, so that the term ichoræmia would perhaps be a fitter one than pyæmia. It is objectionable, however, to alter names, if it can possibly be avoided, so that I will still adhere to the term pyæmia, begging you to remember the symptoms indicated by the name and not to be misled by its literal signification. Pyæmia is thought by some to be contagious; when one patient in the ward of an hospital becomes its subject, other patients who have been operated upon only too frequently become victims. This, however, is not sufficient proof of its being contagious. It is said that pyæmia very rarely occurs except in hospitals. Various reasons are assigned for this,

but I suspect that pyæmia is not so unfrequent in private practice as is often stated.

As regards treatment, our chief aim should be prophylaxis directed to the improvement of the patient's general health before an operation, for we can do very little when pyæmia once sets in. In many cases I have found iron to be very beneficial, and also the chlorate of potash, but in exactly parallel cases they have done no good whatever. Good nourishing diet should be given, and special attention paid to the ventilation of the room or ward. When abscesses form near the surface of the body, as they sometimes do in the sub-acute form of pyæmia, they must be opened; and as these cases are generally the most favourable, quinine and various other remedies may be given, but none of them are at all certain in their action. All we can do is to try, by supporting the patient's strength, to let nature have as good a chance as possible of eliminating the poison and effecting a cure.

## LECTURE VI.

Local Dangers of Suppuration—From the tendency of Pus to point towards the Mucous or Integumentary Surfaces—From encroachment on important Structures—From involvement of Bones and Fascia.

Sinus and Fistula—Causes which oppose successful Treatment—Treatment.

THE LOCAL DANGERS OF SUPPURATION are various and important. They arise chiefly from the mechanical pressure which an increasing suppuration creates on the tissues in its neighbourhood, but in part also from those tissues becoming themselves involved in the ulcerative action. If an abscess be deeply seated under a dense fascia, the pus is thereby prevented from pointing towards the surface, and, being thus circumscribed, it tends to burrow and dissect its way among the surrounding structures, producing in the first place mechanical disturbance, which, by exercising an unnatural and injurious pressure, tends to impair the vitality of the adjoining tissues, and so prepares the way for the more destructive ulcerative action which may follow.

The local dangers of abscess are modified according to its position ; and of these dangers the most important may be classified thus :—*First*, Such as arise from the proximity of an abscess to mucous canals or important cavities. *Second*, Those produced by the encroachment of an abscess on important vascular structures ; and *Third*, Those arising from the involvement of bones and fascia.

In the first class, the danger arises from the tendency of collections of pus to point towards the free surfaces of the body—the cutaneous or mucous ; influenced by the general law, that the direction will be that in which it meets with least resistance. Thus, in abscess in the ischio-rectal fossa, the pus, bounded below by the dense integument of the hip, and by the ischio-

rectal fascia, and levator ani internally, and the strong obturator fascia externally, makes its way towards the rectum at the inner and lower part of the space where the ischio-rectal fascia becomes thin and cellular immediately above the sphincter ani, and there it undermines, thins, and ultimately perforates the bowel ; the abscess very generally opens also towards the integuments of the hip, and so gives rise to sinus or fistula. Another example may be found in the case of a perineal abscess, where there is great danger of the matter burrowing, and finding its way into the urethra. Again, an abscess situated at the root of the neck is more likely to burrow and extend behind the pleura, or, by ulceration, to perforate it, than find a way of exit through the more superficial textures. If the abscess be situated higher up in the neck, the matter may press injuriously on or even ulcerate into the larynx or pharynx, and that even in a shorter time than it could possibly make for itself an opening externally through the dense fascia of the neck. Then we have, in addition, the too familiar example of a similar destructive process, in the ordinary whitlow, which, if left unopened, leads to destruction of the softer textures, and even of the bone itself ; because the aponeurotic sheath of the tendons of the fingers, beneath which it has its origin, being too dense to give way, the inflammation must extend underneath.

The rationale of the processes which cause these dangers being understood, the indications as to treatment must be obvious, and they are simply these :—to make early and free incisions, so as to give ample room for the evacuation of the pus, and thereby avert the evil consequences which we have just been considering.

To the second class of dangers—those arising from the encroachment of an abscess on important vascular structures—belong those cases in which the coats of an artery may be ulcerated through, and serious or fatal hemorrhage take place in consequence. The very possibility of such a result as an artery giving way in the cavity of an abscess, is denied by some ; yet the evidence in support of it is to my mind conclusive. An



abscess forms frequently over a large artery, and, in such parts as the neck and axilla, where there is abundance of loose cellular tissue, the purulent matter finds ready access to the vessel, and, although vascular textures are very tenacious of vitality, yet if they be fairly dissected, as it were, by the pus, their vascular supply is destroyed; and their vitality, being thus impaired, ulceration follows, and the coats give way before the pressure of the circulation, and the blood then escapes into the cavity of the abscess. It must, indeed, be admitted that the giving way of an artery into an abscess is a very rare occurrence; yet it does sometimes happen. Mr. Liston on one occasion opened such an abscess, and was surprised to find the incision followed by a gush of blood. A case of a similar kind occurred in our own Infirmary, under the care of the late Dr. Mackenzie; but in that instance the abscess simulated an axillary aneurism, and the operation for that disease was performed; but the patient died from secondary hemorrhage, and on *post mortem* examination it was found that the artery had been opened into by ulceration from an abscess surrounding it, and that the pulsation so communicated had given rise to the idea that it was an aneurism.\* This danger, therefore, should always be borne in mind, as a reason for promptly opening abscesses near vessels; and even, if on opening such an abscess, nothing but pure pus escape at the time, you must not consider this to be conclusive evidence that the vessel is unaffected, but watch the case carefully, for after a lapse of six or eight hours the artery or vein may give way, and serious hemorrhage result. This is probably caused by the weakened coats yielding to the force of the circulation, after the equable fluid pressure which surrounded them has been removed, or it may, as stated by some, be due to the entrance of atmospheric air, which hastens putrefaction—and the consequent bursting of the coats of the vessel. At all events, one thing is evident, namely, this, that abscesses so situated should be opened early, for otherwise the veins and arteries are in great danger. If bleeding does occur in such a case, the best treat-

\* *Edinburgh Medical Monthly Journal.* February 1852.

ment is to tie the vessel above and below the point where it has given way ; or, if the arteries be small and deeply seated, you may succeed in arresting the hemorrhage by pressure.

The third class of dangers includes those affecting bones and fasciæ. In some cases of abscess the bone is primarily affected. Thus, in the case of whitlow, already alluded to, we have reason to believe that the inflammation does not always begin in the tendinous structures, but sometimes has its origin in the bone itself, and there are cases in which sinuses and fistulæ are prevented from healing by the presence of diseased bone. There are other cases, however, in which a perfectly healthy bone may become diseased by the encroachment of a neighbouring abscess and have its vitality speedily destroyed. The fascial textures themselves are also liable to become involved in the morbid action, and when this does occur they suffer to a greater extent than do the softer tissues, owing to their denser texture and lower type of organisation. In connection with an abscess of the forearm or thigh, the fasciæ frequently sloughs extensively.

These examples, therefore, will, I hope, suffice to impress on your minds the importance of opening acute abscesses *early* and freely, so as to relieve the existing disease, and prevent further destruction.

Amongst the unfavourable results of suppuration, we often meet with the condition termed SINUS or FISTULA. The term sinus is used to express that condition which we meet with in cases where the cavity of an evacuated abscess has failed to contract and heal, but where it remains open and continues to pour from its surfaces a thin unhealthy discharge of a gleet or mucopurulent character. Gradually the walls become thickened and callous, the cavity diminished in size, the lining surface smoothly glazed, like a mucous membrane, the discharge lessened in quantity and altered in quality. The action is sluggish, without tendency to heal, and thus the diseased condition becomes established. On introducing a probe at the opening, it is found to pass inwards in a widening course, while here and there it may meet with projections, which render its



progress irregular and tortuous. After a time these attempts at closure may become more numerous and continuous, until at length the original cavity, thus limited by them, may assume the character of a small hardened tubular canal. From the inner surface of this channel a thickened moisture exudes, and lymph is effused into the surrounding textures, so that the channel becomes more callous and persistent, having just sufficient vitality to prevent it from sloughing, but not enough to produce healing action. A sinus may be either straight, or tortuous, generally the latter, and it may have either one or two openings. If it has only one opening it is termed incomplete or blind: if it has two—the one opening internally, the other externally—it is termed a complete fistula. An incomplete fistula may have its opening either on an internal or an external surface; in the former case it is more likely to become a complete fistula than in the latter, on account of the tendency of discharges to make their escape through the integument.

The conditions which give rise to the formation of sinus and fistula may be regarded as being partly vital and partly mechanical. The vital causes consist in an original depravity or induced debility of constitution. The mechanical are—The extent and character of the original abscess; inefficient treatment of the original abscess; special causes opposing successful treatment.

The tendency to the formation of sinus and fistula is regarded by some as being simply a manifestation of the strumous taint in the constitution, hence the frequency with which it is found associated with that habit; and as such patients are also the most liable to suffer from chronic abscess, we find that in nine cases out of ten, sinus and fistula supervene on that form of suppuration. But if the vital powers be lowered from any cause whatever, the liability may be induced thereby, and that all the more if aided by inefficient treatment on the part of the surgeon. For if an ordinary abscess has been only partially opened, or if one opening only has been made where there should

have been one or more counter-openings, then the pent-up matter does not get free vent, but is forced to burrow amongst and impair the vitality of the surrounding tissues, thus preparing the way for such results as we have described. Other examples of the consequences of inefficient treatment are found in cases where the diseased condition has been rendered persistent, in consequence of the original abscess having been opened too early, or allowed to remain unopened too long; also where it has been injudiciously stuffed with lint, or where poulticing has been too long continued.

The causes which oppose successful treatment are, for most part, due either to the anatomical disposition of the part, or to the presence of foreign bodies or diseased bone. Thus, if the original abscess be so situated as to admit of movement of the textures one on another, the cavity may be prevented from closing by the friction of the opposed surfaces as well as by the movements which give rise to that friction. In such cases the parietes do not attain a great degree of callosity, but the surfaces present an unhealthy appearance, and the discharge is thin and copious. Examples may be found in abscess of the leg, or the axilla, or the ischio-rectal space. After an abscess situated under the deep fascia of the leg, a sinus may form, extending from the head of the fibula to the external malleolus, and be kept open by the movements of the part. Or, if the axilla be its seat, the motions of the arm may give rise to a similar result, aided by the facilities for burrowing afforded by the loose cellular tissue of the neighbourhood.

The ischio-rectal space is peculiarly liable to disturbing influences from the movements to which the parts are subjected during the passage of fæces, or the act of coughing; hence this space is a very common seat for sinus and fistula, and here they generally assume their most persistent form.

The presence of foreign bodies, or substances which act as such, forms another barrier to successful treatment. These may be either intrinsic or adventitious, generally they are of the former kind, and the removal of the conditions which give

rise to them must form a special part of the treatment. Thus, in stricture of the urethra, the irritation may give rise to an abscess in the cellular tissue of the perineum ; this may at length open into the urethra, and by means of it the urine will escape into the abscess, where, acting as a foreign body, it will prevent the healing process. At length an opening occurs in the skin, through which the urine passes, and thus a fistula in perineo is established. So long as the urine escapes the fistula remains, and the urine will escape as long as the stricture remains—for such fistulae always open posteriorly to the stricture—consequently to cure the fistula we must first remove the stricture.

In cases of fistula in ano, mucus from the bowel, or thin fluid fecal matter, may enter and act as a foreign body, thus keeping up the irritation ; so that in this case we have something superadded to the movements of the parts, which forms a barrier to treatment. In such a case we must cut open the bowel along the whole length of the diseased tract, and divide the sphincter ani, so as thereby to give the diseased parts complete rest.

These two cases—fistula in ano and in perineo—arise from, and are kept up by, special causes, and therefore require the special treatment I have indicated.

The *treatment* of an ordinary sinus, resulting from an abscess, is very simple. A director is passed along the whole extent of the sinus, and the tract laid completely open with a curved sharp-pointed bistoury, or a probe-pointed bistoury alone may be used. Afterwards the application of warm-water dressings, or some stimulating lotion, will promote gradual absorption of the hardened walls, granulation, and cicatrization. In most cases this is sufficient, but sometimes, when the tract is very hard, the use of iodine, blisters, and nitrate of silver, as stimulants, may be required. If the part is very hard, or if a portion of dead cellular tissue be present, it may be necessary to destroy it with potassa fusa. In a very long sinus, as for example one extending from the head of the fibula down to the

external malleolus, it would be very severe treatment to make an incision along its whole extent, and in such a case it is better to enlarge the openings above and below to an inch or two in length, then introduce a piece of drainage tubing, or a strip of lint soaked in tincture of iodine, and draw it through the sinus, leaving it for a little till some action is excited ; a bandage is then applied, with a view to press the one wall of the sinus against the other, the openings being left uncovered. The sinus soon begins to heal ; if, however, the part in the centre does not heal readily, we must make an incision into it and paint it with iodine as before. If this does not cure it, we must open it above and below ; and should even this prove insufficient, we must lay it open along its entire length. We may require to apply a poultice, after opening the sinus ;—according to some, this softens the callous parts.

In fistula in ano, the rectal wall of the fistula is divided, like any ordinary sinus, with a probe-pointed bistoury. If any collateral sinuses exist, they must also be incised. In fistula in perineo, if the sinus be due to a stricture, the first part of the treatment is to cure the stricture, either by splitting it or by gradual dilatation, or by perineal section. When this is done, the urine passes more readily by the urethra than by the fistulous opening, and often we do not require to touch the sinus at all, as it generally soon heals of itself. If, however, the sinus still continue, we must adopt other treatment. Here we do not require to open up the whole length of the sinus, but merely to dilate the orifice, and to stimulate the fistula, by touching it with nitrate of silver or tincture of iodine, or a red-hot wire.

Fistula in perineo sometimes depends on chronic abscess of the prostate, and is exceedingly obstinate. Unless the prostatic disease be removed, the fistula may prove incurable. Ordinary fistulae, however, speedily yield to the treatment I have spoken of.

## LECTURE VII.

Ulceration ; its nature and progress—Short sketch of the Healing Process—  
Healing by the first Intention : by Granulation—Opinions of the older  
Surgeons with regard to the Healing Process—More modern Views—General  
Classification of Uleers—Uleers of the first class—Those prevented from  
healing by defective action—The weak Ulcer ; its character, progress, and  
treatment.

ULCERATION is another result of inflammatory action. It consists essentially in molecular death of the part. During the process a copious exudation is rapidly thrown out, which does not undergo transformation into permanent texture, but becomes broken down and disintegrated, causing destruction of the parts in which it occurs. The collected matter gives rise first to swelling ; it then points towards the surface by causing small elevations in the more attenuated parts of the superjacent integument or mucous membrane. These at length lose their vitality from the continued pressure of the fluid, and give way ; small openings are then established on their surfaces, and each begins to emit a thin ichorous discharge. The ulcers so formed tend to increase in number and dimensions until they gradually coalesce, and at length one large open sore or ulcer becomes established.

Such are the stages of the process as it usually occurs in the healthy subject, but ulceration is more apt to take place in patients of an unhealthy constitution, or those in whom the vitality of the tissues generally is below the normal standard. In them, therefore, the plastic lymph, which is thrown out with a view to the reparation of the breaches of continuity, has lower powers of organisation, and the process is proportionally tedious.

When the destructive process has ceased, an effort is made towards repair. This consists in the formation of little bright



vascular projections from the hollow and sides of the ulcers, which, being extremely delicate, are generally covered and protected by a thin layer of pus. This also serves to keep them moist, and so favours their growth. These granulations are nourished by small loop-like vessels, which enter at their bases and are prolonged towards their apices ; this constitutes Granulation, a process of healing presently to be described.

Ulceration and mortification bear very close relations to each other, the difference being that ulceration runs a much slower course. Perhaps the phagedenic ulcer may be regarded as the connecting link between ulceration and mortification ; it is just a very rapid form of ulceration.

Before you can understand the principles of the treatment of ulcers, it is necessary that I should explain shortly the different forms of the healing process. This may take place in two ways, either primarily or secondarily. The former consists in healing by adhesion without the formation of pus, and is termed primary union, or healing by the first intention. The latter consists in healing by granulation after the formation of pus, and is termed secondary union, or healing by the second intention.

Healing by the first intention generally occurs in the case of wounds which have been inflicted by sharp cutting instruments, such as the blade of a knife, provided that the cut be not very large. In these cases, if the incised wound be healthy, and the severed surfaces be placed in close and accurate apposition, we shall find, after an interval of six or eight hours, that the line of union has become coated by a layer of viscid semi-gelatinous matter, by which the edges of the wound are retained *in situ*, and the atmospheric air excluded. These gradually become reddened, painful, and tense ; but the swelling which is present is merely excited action. The edges become glazed with lymph, the swelling decreases, and in ten days or so the edges are firmly united by newly-formed white fibrous tissue, which, at the cutaneous surface, produces a white mark termed a cicatrix. The deeper surfaces of the wound are at first glued together by coagulated lymph ; most probably



they are united permanently by new-formed fibrous tissue ; but this is not known to be always certainly the case, for sometimes two cut surfaces unite in such a way that it is impossible to say exactly where the wound had been. The older surgeons used to think that wounds could heal only if the edges were applied together with such exactitude that the mouths of the divided vessels might be brought together, each to each, and the nutrition of the part thereby secured. We now know, however, that too much pressure gives rise to morbid instead of healthy action, and therefore we have recourse only to very slight dressing in the treatment of such wounds. A strip of dry lint should be laid along the line of union, and no other dressing used ; the lymph will then form with the lint a covering, which gives additional protection, and at the same time prevents the entrance of atmospheric air. I said *dry* lint, for no wet dressings should be used, as these tend to disintegrate the lymph, and so prevent the formation of an adhesive coagulum over the wound. The part should also be kept cool, for a high temperature tends to produce excitement, and favours the development of pus from the cut surfaces.

Healing by second intention, or by granulation.

When a wound fails to heal by the first intention, it gradually assumes the appearance of an ulcer ; suppuration takes place on its surface, and under the thin superficial layer of pus are formed a number of small bright-red acuminate granulations. In minute structure these granulations consist of delicate fibro-plastic cells and fibres, with a minute loop of bloodvessels. The fibro-plastic cells give off from their surface a series of prolongations, which go to the formation of white fibrous tissue.

According to the cell-pathologists, these fibre-cells are formed from the nuclei of pre-existing fibrous tissue. But according to the molecular pathologists, they are formed from an exudation. The pus which covers the granulations is said by the former authorities to be formed from the cells of the granulations, while the latter suppose it to be the result of an exudation thrown out on their surface.

The older surgeons supposed that in the case of ulcers the process of healing was effected by these granulations forming new texture, layer after layer, until the cavity of the sore was filled up, and that then the cicatrix spread over it from the sides and afforded a covering. Some held that the fibrous tissue forming the cicatrix might be thrown out from any part of the granulating surface, while others believed that the cicatrix spread always from the skin at the margins of the sore and extended inwards towards the centre. This is now known to be the correct theory. Sometimes we have the appearance of detached islands of cicatricial texture forming in the area of the ulcerated surface; but in such cases the cicatrix is always developed from portions of true skin which have not been destroyed by the ulceration. This is very well exemplified in cases of burns and scalds, where the whole surface of the wound looks red and granular, although the whole of the true skin has not been destroyed; so that what looks like the granular surface is really the skin, and from it the cicatrix spreads.

In other cases, where the ulceration leads to complete loss of skin on the surface, it always heals from the circumference to the centre.

It is thought by some that in secondary union the sore heals entirely by contraction, and that the granulations never fill up the hollow. They say that if we look at the cicatrix of an old ulcer we always find a depressed cicatrix; while, had the wound been healed by filling up, then there ought to be a level cicatrix.

According to these authorities, the real loss of texture in an ulcer is not nearly so great as it seems to be. The depth of an ulcer depends on the swelling of the surrounding textures. The healing of the sore entirely depends on the subsidence of the inflammatory action, or the disintegration and absorption of the exudation; thus reducing the tension, and therefore diminishing the surface of the sore, through the edges of the skin approaching each other when the swelling is reduced. This doctrine, in its essential points, is the true one, but it goes too far when

it affirms that *no* new material is formed, because some permanent tissue is formed by the granulating process. For example, in ulceration over a bone when the periosteum has given way, as the ulcer heals there is a layer of granulations spread over the bone; the wound heals principally by contraction, but there is always a certain amount of new fibrous tissue formed by the granulations, though not enough to fill up the cavity of the sore.

When there is much muscular texture lost and not much skin, the wound will heal very rapidly, and with a very small cicatrix; but when much skin is lost, by sloughing, a large cicatrix is formed, and contraction of the part follows. I believe, then, that in all cases of healing by secondary union there is a small amount of new texture formed from the granulations; that the cicatrix grows from the surrounding skin, and that contraction of the surrounding parts is the chief cause of the closing in of ulcers.

The cicatrix is a substitute for skin. It consists of white fibrous tissue, and is very unyielding, being firmly attached. Its vitality is low, in consequence of which it easily dies when inflammation is set up in it. Usually it is possessed of but slight sensibility; at other times, however, it is extremely sensitive.

ULCERS may be divided into three classes:—

1. Those in which ulceration is slow and the healing process seems to be prevented by low vitality and defective action. Of these we have good examples in the Weak and Callous ulcers.
2. Those in which the ulceration progresses rapidly and the healing process is prevented by over-excitement, excessive action or irritability of the part. This class is exemplified in the inflamed and irritable ulcers.
3. Ulcers in which healing is prevented by specific action, as in the case of strumous, syphilitic, and cancerous sores.

To the first class belong the *weak* ulcer, and the *callous*, indolent or chronic. These two, although classed together, are nevertheless widely different in their character, and require different treatment.

The WEAK ULCER may owe its character either to diminished vitality of the part, or to debility of the constitution generally. The following distinctive features may enable you to recognise it :—You will find it to be pale and yellowish in colour, usually soft, but sometimes cedematous ; the surface elevated above the level of surrounding parts, and covered over with exuberant granulations, which sometimes present a purple congested appearance, and sometimes assume a pale, flabby, pinkish or yellowish colour, but never the bright red colour presented by a healthy healing sore. The margins are generally either colourless or of a pale purplish colour, and the surrounding integument either may or may not be swollen and cedematous.

Now, you might very naturally suppose that these exuberant granulations were an indication of active growth, but such is not the case, for although excessive in quantity, they are greatly deficient in quality. They are just badly-formed granulations, infiltrated with serum, and are entirely different in character from the short, firm, solid granulations, which are to be seen in healing sores, or in the ulcers of strong and healthy patients. Sometimes the granulations give way, and then the contained serum is poured out on the surface, and a yellowish, sloughy appearance is produced. A somewhat similar result may sometimes follow the injudicious application of a stimulating lotion.

Ulcers arising from burns or scalds are always weak, owing to the impaired vitality of the part, and the slow process of healing, together with the extreme exhaustion of the constitution, which always follows severe burns. In other cases the weak action arises from constitutional causes ; any injury inflicted on a person of feeble health may give rise to a weak ulcer. Like most other ulcers, they are generally more commonly met with in the inferior than the superior extremities. This is due to the fact that the lower extremities are more liable to exposure and violence than the upper, and they are also more apt to be congested from their dependent position. Weak ulcers are, however, oftener met with in the arm than any other ordinary form of ulcer.

The *treatment* consists in endeavouring to invigorate the part and the system generally. We destroy the unhealthy surface of the sore in order to establish in its place a more healthy process of granulation. This we do by painting over the surface lightly with solid nitrate of silver, and afterwards applying lint dipped in warm water, or moistened with a slightly-stimulating lotion, such as a solution of sulphate of zinc, 1 or 2 grs. to the oz. of water ; or a weak solution of chlorinated soda. Then we place the part at rest, give local support by means of methodical bandaging, in order to remedy or prevent œdema, or congestion of the limb ; and, in addition to all this, we endeavour to support the constitution by the administration of suitable nourishment, and stimulants if necessary. In cases of severe burns and scalds, we must be prepared to receive a check every now and then in the healing process. The structure of the ulcer and the texture beyond has undergone consolidation, and had its vitality impaired ; but, generally speaking, by the treatment I have indicated, you will at length succeed in effecting a cure. The form of local stimulus should be changed from time to time ; say from chlorinated soda to sulphate of zinc or sulphate of copper, of the strength of 1 or 2 grs. to the oz., or black-wash, which consists of 4 or 5 grs. of calomel added to the oz. of lime-water.



## LECTURE VIII.

Ulceration continued—The Callous Ulcer : its appearance, progress, and treatment  
—The second class of Ulcers—Those prevented from healing by excessive action—The Inflamed Ulcer : its characters, causes, and local and constitutional treatment.

THE CALLOUS, INDOLENT, OR CHRONIC ULCER, is much more common than the weak ulcer. It generally occurs among the poorer classes, and as these patients cannot observe the conditions necessary for its cure—namely, rest and proper treatment—it becomes, in their case at least, somewhat intractable ; for often, after it has been so far healed, the patient goes back to work, and the ulcer is reproduced in perhaps a worse form than before. The characters of the callous ulcer are well marked. The sore is generally large and deeply excavated ; its margins are white, rounded, and callous ; its surface presents an orange or brownish varnished appearance, or is coated by a thin sanious discharge when irritation is present ; it is seldom covered by granulations. The surrounding skin is thickened, hard, and discoloured, generally assuming a purplish or bluish grey tint, and the whole limb usually becomes considerably swollen and deformed, presenting sometimes an appearance not unlike the condition known as elephantiasis.

In the weak ulcer there is an appearance of overgrowth ; here we have no growth at all—no granulating surface, but the appearance of great destruction of texture. I say the appearance, for in reality the ulcer has not dug deeply, but the thickened margins and swollen textures surrounding it make it appear deep, and this appearance is very characteristic. It is to the thickened and elevated margins and surrounding induration that we must look in order to ascertain the true nature of the sore, for these are conditions which prevent successful repair. The



thickening is due to the solid chronic œdema of the cellular tissue around the ulcer, which, by distending the skin, separates still further its margins, producing a constant tendency to increase rather than diminution of the ulcer. Fortunately for the patient, this form of sore is not very painful.

The callous ulcer often supervenes on the varicose, as that condition of the veins tends to favour œdema of the limbs, and consequently the development of such ulcers.

*Treatment.*—The first indication is to get rid of the chronic œdema, and formerly this was sought to be accomplished by the application of bandages and plasters; but now we adopt a much quicker and surer mode, which consists in the application of a fly-blister. This acts as a deobstruent, and under its influence the hardened margins slough, the exudation becomes absorbed, and healthy action begins. The first thing to be done is to keep the patient perfectly quiet in a recumbent posture. After a day or so we apply a blister round the sore. When the ulcer is large it is best to leave the surface of the sore uncovered by the blister, because in the centre there is not much exudation to be got rid of, and there is a risk of over-excitement in the sore, and of absorption of the cantharides, by which strangury might be produced. When the ulcer is small we may apply the blister over the whole surface. The blister is to be kept on for ten or twelve hours, till it begins to rise; the skin will not vesicate as healthy skin does, but sufficient irritation will be excited. After the blister is removed we apply warm-water dressings, or a soft linseed-meal poultice over the blistered part. Under this treatment the margins of the sore, which have little or no vitality, generally slough and leave a healthy margin. At first the skin appears more swollen, and the surface of the ulcer looks less healthy, but gradually the swelling diminishes, and after four or five days the skin feels soft again, the surface of the sore becomes granular, and loses the varnished appearance which it had at first, and the ulcer begins to assume a more healthy character. We then apply a bandage from the foot upwards, with strips of warm-water lint crossing over the surface of the sore, so as

to act like a many-tailed bandage. This supports the limb, and also acts as a gentle stimulus, and the exudation rapidly disappears. This treatment is to be continued for about a week, and then some stimulating lotion may be required. The ulcer diminishes very rapidly in size, owing to the relaxation of the skin, which arises from the cellular tissue being relieved of the exudation. After a time the action may flag, and then we must attend to the patient's health, and begin to employ more pressure, and paint over the surface with tincture of iodine to produce renewed action. Should, however, the ulcer still refuse to heal, apply a second blister over those parts where the exudation is greatest, for the exudation is often thrown out in irregular masses. Lastly, when the ulcer becomes very small, we bandage the limb firmly from the foot upwards, and bring the margins of the sore together by broad straps of adhesive plaster. The plaster treatment should only be used when there is a very small sore.

Another plan of treatment has been proposed for callous ulcers, which is founded on the principle of facilitating contraction of the sore by relieving tension of the integuments. This is effected by making long collateral incisions through the skin on either side of the ulcer, in the hope that its margins will thereby be allowed to contract. This method of treatment is occasionally useful ; as a general rule, however, it is objectionable, because one or two new ulcers might form where the incisions were made. It may be employed sometimes when there seems to be an adhesion of the integument, but otherwise it is not nearly so good as the treatment previously described.

I advise you not to apply blisters to callous ulcers when you find the urine highly albuminous, thereby indicating disease of the kidneys ; for in that case the swelling of the limbs is general, and dependent largely on the diseased kidneys, and a blister will not remove it ; moreover, the active principle of the blister, cantharidine, may be absorbed, and cause still further irritation of the kidneys.

Some have thought that the thickening of the edges of the

ulcer resembles the thickening of the skin called a corn, and have recommended that the skin should be sliced away as we would do a corn. But this is only an example of the bad treatment to which a bad pathology leads. A corn is due to thickening of the epidermis, whereas the thickening of the skin around a chronic ulcer is due to exudation in the true skin and subcutaneous areolar tissue.

The second class includes ulcers prevented from healing by excessive action.—Two ulcers are included in this class—the *Inflamed* and the *Irritable*.

(1.) THE INFLAMED ULCER.—A sore may possess this character from the commencement, or one of any other kind may assume this form. It is recognised by a bright red colour of the skin, irregular caten-out margins, and viscid unhealthy discharge, which is frequently mixed with blood. Its surface is covered with florid, vascular, and very sensitive granulations, or an ash-coloured slough. The surrounding integument becomes tense, glistening, and painful ; in colour it varies from bright red to a crimson or lake, and its temperature becomes elevated considerably, although not to a degree equal to the sensations of the patient. The blush or discoloration of the skin is not limited to the immediate vicinity of the ulcer, but may extend for a considerable distance up and down the limb. The swelling is also diffuse, and under the pressure of the unhealthy exudation which is poured out into the areolar tissue, disintegration takes place, and small outlets or ulcers are formed, leaving between them narrow bridges of skin, gradually merging towards one another ; these at length give way, and a large rugged ulcer is formed. This condition is attended with all the cardinal symptoms of inflammatory action. The limb has a pulsating feeling, and sometimes becomes erysipelatous. The surface of the sore often takes on a sloughing action, and gangrene may supervene. An example of this is sometimes seen in acute inflammation of the glans penis, which is very frequently followed by death of the part. When the inflam-

matory action is confined to the site of the ulcer, little constitutional disturbance accompanies it; but when the inflammation is extensive it is attended with considerable distress; the pulse becomes quick, hard, full, and the other febrile symptoms manifest themselves.

The causes may be of an endemic or of an epidemic nature, but most commonly it arises as the result of the irritation of a sore already existing; from the part being over-stimulated, as by cold, heat, exercise, or some irritant.

*Treatment* must necessarily be of a twofold character—local and constitutional—and each must be modified according to circumstances. In most cases it must be active. If symptomatic fever be present, apply simple poultices to the sore, together with opiate fomentations to the inflamed portions of the limb. If there be a great amount of tension in the part, we endeavour to relieve it by means of incisions or punctures along the limb, and afterwards bathing or fomenting it. Thus, the serous discharge is favoured, the inflammatory congestion of the part relieved, and the acute œdema frequently dispersed.

During this stage constitutional symptoms must be combated. When a moderate amount of depletion has been effected by the incisions, we give antimony and opiates internally to produce diaphoresis. The diet should be antiphlogistic in its nature—nutritive yet non-stimulant. But if the sore be in a more advanced condition its character will have changed; and if there be a great amount of exudation and tension, it may threaten to break down and point. In such a case you must deplete locally, but you must not adhere to the antiphlogistic diet; beef-tea, iron, and wine must be given.

Where there are bridges of skin as already described, they should be simply cut across; by so doing you deplete, relieve tension, allow the skin to retract and the matter to escape. This, instead of destroying, really becomes the means of saving the skin, for if not so divided it would speedily ulcerate and slough away. Favour the escape of the exudation by the application of poultices. If a black point be beginning to form, then apply

a charcoal-poultice as antiseptic to the sloughing part. There is no remedy equal to charcoal for checking this form of diseased action. The charcoal-poultice is made by dusting a little powdered charcoal over the surface of an ordinary linseed-meal poultice ; after its removal, warm-water lotions containing opium should be applied, and the warmth carefully sustained between the fomentations.

When the acute action has subsided, granulations of a normal kind begin to appear, the skin contracts, and the healing process is established. The local treatment at this stage is a matter of some importance, and great care must be taken to avoid doing either too little or too much. Warm-water dressing must be continued for some time before using stimulants to the part. The after-treatment consists in the use of such lotions as are suitable to the general treatment of a healthy healing sore. The part should be bandaged in order to give support and to afford the slight stimulus of pressure, but great care must be exercised in regulating the amount of that pressure. The "many-tailed" is the best form of bandage to apply ; it should be made of lint, and applied just after being wrung out of hot water.

*Constitutional Treatment.*—This, as we have already indicated, should consist chiefly in the use of opium and antimony, and in the careful regulation of the diet. The antimony is given to relieve the circulation, and by its use a more heroic treatment may often be avoided. If the patient cannot stand antimony, then we give diaphoretics, such as the compound powder of ipecacuan and opium, or small doses of the acetate of ammonia. If the inflammation should change to an erysipelatous type, then give tincture of the muriate of iron, in medium or large doses, three or four times a-day, watching its effects. Camphor mixture, with sweet spirit of nitre, may be given in small doses, so as to act gently on the kidneys, and large quantities of bland diluents to wash out the tubuli uriniferi.

The great danger to be avoided with regard to diet is overstimulation at first. Give mild and nutritious diet to begin with, gradually increasing the quantity and strength according to the requirements of the case.



## LECTURE IX.

Ulcers of the second class continued—The Irritable Ulcer : its characters, causes, and treatment—Ulcers of the third class—Those prevented from healing by peculiarity of action—General characters—The Constitutional Sore : its varieties, appearance, and treatment—The Serpiginous Ulcer : its treatment.

THE IRRITABLE ULCER, although placed in the same class as the foregoing, is widely different in character and appearance. It is attended with little or no surrounding inflammation, and the parts in its neighbourhood do not become swollen or tense. It owes its origin almost entirely to constitutional causes, being often associated with some form of uterine disturbance ; hence you will find it most frequently in females who are suffering from amenorrhœa or menorrhagia. Unlike the ulcers which arise from accident, this—being due to some cause in the system—generally manifests itself in a particular part of the body. And the site where it is most frequently found is low down on the fibular side of the limb, just above the external malleolus.

In appearance it resembles the condition you would find if you sliced the top off a large boil, leaving behind it a hard raised base with flat surface and somewhat uneven edges. These edges are not irritable at first, but as ulceration goes on the base is first gradually absorbed, and then the edges become inflamed. The surface of the ulcer is covered with reddish brown granulations. Before surrounding inflammation sets in there is intense pain, which becomes aggravated by the slightest touch. At night there are always extreme exacerbations, which give rise to a condition so intolerable as to deprive the patient of sleep. Under this the general health gives way. The patient loses appetite and flesh, the tongue becomes foul, the pulse quickened,



the digestive system deranged, and low febrile symptoms manifest themselves. All this may occur without the local inflammation extending far. A peculiar morbid nervous irritability in and around the margins of the sore is characteristic of this form of ulcer.

The *Treatment* varies according to the view taken of the pathology of the ulcer. Opium has been greatly recommended both externally and internally; but although I advocate its local application in the form of fomentations, I cannot say that I so highly approve of its internal administration. I am inclined to think that it will be more likely to do harm than good, by deranging the digestive organs and arresting hepatic secretion. By far the best treatment, in my opinion, is to exhaust the morbid irritability of the sore, in the early stages, by means of a thorough application of the solid nitrate of silver. It must not be applied lightly, but must be rubbed into the sore strongly and thoroughly. This remedy is undoubtedly painful at the time, but it is followed almost immediately by the most complete relief; the nocturnal exacerbations are got rid of, and opiates are thus rendered unnecessary. The part should be treated afterwards with warm-water dressing, and supported by bandages. If opiates have been given, they should now be withdrawn, and tonics, especially chalybeate tonics, administered instead, together with a nutrient diet. This method of treatment will seldom fail to cure the irritable ulcer.

It must be remembered that though in irritable ulcer you may have sometimes severe inflammation set up, with determination of blood to the part, yet these are only accessory and adventitious conditions, and form no part of the special characteristics of the ulcer.

The third class consists of ulcers which do not heal on account of specific action, or peculiarity of action.—Under this head come *cancerous* or *canceroid*, *sypilitic*, *strumous*, and *scorbutic* ulcers. The surface of these sores is very peculiar. It is generally covered with a sloughy material of a dirty-grey or pale-yellow colour, and emits an unhealthy discharge.

The margins may be thickened and rounded, or irregular and ragged, and are liable to be modified by rapid inflammation attacking the original sore. The ulcer appears as if scooped out with a gouge ; its form and peculiarities, however, are chiefly determined by the constitutional conditions which accompany it, and these must in all cases be our guides as regards the treatment. We can follow no fixed indiscriminate rule, but must adapt our remedies to the constitutional peculiarity. Thus in some cases of cancerous ulcer we have no hesitation in cutting out the sore, provided that the patient be strong, the disease still distinctly localised, and the neighbouring glands unaffected, for by doing so we prevent the disease from spreading by continuity to the adjoining textures, and perhaps save the system from being involved in the morbid action. On the other hand, if the same case, or a case having a similar history, should be seen for the first time after the neighbouring tissues and the constitution have become affected, our treatment must be merely palliative, for active interference in such a case would only accelerate the destructive process. For although it is probable that the primary cause of the affection is to be found in some peculiarity of constitution in the blood or in the solid textures, it is nevertheless true that the local disease acts as a germinal centre for the propagation of the malignant action, and supplies materials for the development of morbid deposits in other regions of the body. So that, by timely excision, we not only delay the fatal result, but give the patient the only chance of permanent immunity from the disease.

In other forms of specific ulcer, due to constitutional causes, we do not have recourse to removal by the knife, because the parts beyond would immediately take on the diseased condition, but we combine internal remedies with local treatment. In primary syphilis, for example, we treat the local disease by applying escharotics so as to destroy the surface of the chancre ; and if constitutional symptoms afterwards appear, we give mercurials along with iodide of potassium—but we do not excise the ulcer. In scrofulous ulcer, which is chiefly dependent

upon the constitution, the special treatment is entirely constitutional.

Some forms of ulcers of this class require particular notice, and of these we shall *first* consider the so-called CONSTITUTIONAL SORE, or Cellular Tissue Ulcer. This is a chronic form of ulceration dependent upon constitutional causes ; it is often the result of struma and syphilis combined, the syphilis being of the tertiary form. The patient, as might be expected, is generally pale and anæmic, and has a cachectic expression. The ulcer varies in appearance somewhat according to the part it attacks. When situated in the limbs, it somewhat resembles the callous sore, being equally deep and thick at the edges, but these are rather more rounded and irritable. The surrounding skin is of a more delicate shade of colour ; for while in the callous it is dark and purplish, in the constitutional it is light and pinkish. They both present the same glazed appearance on the surface. The thickened margins are due to exudation into the cellular tissue beneath the skin, but the exudation is always aplastic and circumscribed in its extent. It seems to be thrown out only in the neighbourhood of the diseased part, and so the swelling is limited to the immediate vicinity of the ulcer or ulcers ; for frequently the neighbourhood becomes dotted over with a series of smaller sores. In this form of ulcer we see a marked contrast to the callous sore, for where the latter exists the limb, as we have already indicated, becomes irregularly swollen and thickened throughout, giving rise to a condition resembling elephantiasis.

The *treatment* must be both local and constitutional. In the earlier stages, when there is considerable swelling present, the application of iodine or of a blister over the exudation and round the margins of the sore will often serve, as in the case of the callous ulcer, to cause absorption of the exudation and stimulate the sore to a more healthy action. More sloughing and disintegration, however, may be expected to follow here than in the case of the callous ulcer, owing to the lower vitality of the exudation in this form of ulcer. After removal of the blister, warm-water lint-dressing and bandages should be applied for

a few days. Thereafter it may be treated by local remedies, to get rid of the foetid discharges and to promote healthy granulations. For this purpose we may use the chlorinated soda lotion or a solution of permanganate of potash, followed by a weak black lotion. Under this treatment the remaining exudation will gradually diminish, and a healthy action set in. Meantime the constitutional treatment must not be overlooked. Such ulcers are generally associated with tertiary symptoms or with an inherited syphilitic taint. The use of mercurials internally is rather contra-indicated, and the iodide of potassium should be used instead. This remedy may be given in five-grain doses twice or thrice a-day, and may with great advantage be combined with small doses of arsenic—say three to five drops of Fowler's solution to each dose of iodide. They should be prescribed separately, so that one or other may be discontinued as occasion may require. By and by other remedies may be given, and of these certain chalybeates are often beneficial, more especially the syrup of the iodide of iron. Cod-liver oil may also be given with advantage, and the diet should be carefully regulated and of the most nourishing description.

Sometimes the ulcer may assume characters different from those I have described, for example, it may become *serpiginous*, where a number of small points creep together, as it were, in a somewhat serpentine course and then coalesce, so as to form a large ulcer. In such cases, the application of sulphate of copper will be found preferable to a blister. The stimulating lotions, of whatever kind, should be changed from time to time, so as to maintain their action, and thus sulphate of copper, nitrate of silver, and sulphate of zinc, may all be used in succession with advantage. We do not wish to increase the strength of the stimulant, but to change its form from time to time; for use seems to weaken its effect. In this case also the patient should be allowed good diet, and cod-liver oil may be taken with benefit, together with the iodide of potassium and arsenic.

## LECTURE X.

Specific Ulcers continued—Lupus : its progress, appearance, and usual site ; its Treatment—Objection to the use of Nitric Acid—Importance of Treatment directed to the general health—The Scorbutic Ulcer : the conditions which precede and accompany it ; its Treatment almost entirely constitutional. The Varicose Ulcer.

LUPUS is a form of specific ulcer very like the cancerous, and often confounded with it. It occurs sometimes in connection with the syphilitic taint, but most frequently with the strumous diathesis. Lupus may commence in either of two forms. The one has been described as tubercular ; the other as herpetic. In the first form the skin becomes thickened and has a tubercular appearance. In the latter form, the skin breaks out into small pimples, each of which bears a vesicle at its apex. These at length coalesce, and then burst and form a sore. The base becomes thickened and the sore gives off a dirty grey discharge. These small sores tend to become gradually larger and more irritable, until at length they merge into one, assume a tubercular form, and true lupus is established. The site where it occurs most frequently is the nose, cheek, or angle of the mouth, and the progress is both rapid and destructive. When it attacks the nose, the lupus is generally of the tubercular form, and after the ulceration has proceeded for some time it assumes the following characters :—The edges of the sore are red, ragged, and irritable. At first they present a sharp outline, as if cut out, but are not much thickened or hardened. They therefore give way rapidly, and so the ulcer extends both in surface and in depth, eating outwards, irregularly, in different directions until at length the whole side of the face may become one mass of disease. The surface of the ulcer is uneven, of a dirty grey or ash colour, and exudes an unhealthy-looking discharge.



Lupus is attended with a peculiar burning heat in the part, together with excessive pain and very often accompanied with fever of a low hectic kind.

The *Treatment*, like that of the other specific sores, should be both local and constitutional. If in a strumous patient we find this form of herpetic eruption, or the tubercular masses beginning to form, we may have recourse to the local application of soothing remedies, such as anodyne solutions. If, notwithstanding this, the disease still advance, we must begin more active treatment at once. The surface of the ulcer should be destroyed throughout its whole extent by the application of sulphuric acid or potassa fusa. Nitric acid is more generally used for this purpose ; but I object to it because it has the effect of coagulating the albuminous portions of the textures, and thus creates a barrier which prevents its full caustic action on the whole extent of the diseased surface beyond. Afterwards simple warm-water dressings, to which a little of Condyl's fluid has been added, are to be used until the irritation ceases. When the slough produced by the escharotic separates, the denuded surface may be treated with weak black lotion, which sometimes heals it up very rapidly. Should that fail, however, and the sore threaten to extend, sulphate of copper may be applied either in the solid form or in saturated solution. In such cases, the sulphate will be found very useful ; it being in fact almost a specific for lupus. When much irritation exists, the stimulating lotions should be discontinued, and warm-water dressings resumed.

Meantime the general health must be carefully attended to. Iodide of potassium should be administered in three or four grain doses, along with either arsenic or cod-liver oil, according to circumstances. Or, should the patient be very anæmic, the syrup of the iodide of iron may be given at first, along with cod-liver oil. Quinine, although useful in the later stages, should not be ordered in the earlier, as it is too stimulating to be of service then. Occasionally a gentle saline purgative may be of use, and although, as a rule, it is not advisable to



give mercurials, yet they may now and then be combined with the saline, as alteratives, with advantage. The diet should be of a simple nutritive kind, and if wine be given, it also should be light, and given sparingly. Lupus has a great tendency to return, and therefore, although the medical treatment may be intermitted, the nutritive should be continued for some time afterwards. As might be expected, this disease, however well treated, often results in great deformity ; and for the remedy of this defect, plastic operations are often required. Let me warn you, however, never to proceed to operate without the greatest caution, for as I have already said, very little irritation will cause the lupus to break out afresh. You ought therefore to wait for at least a year after the cessation of the disease, and complete cicatrisation of the wound, before proceeding to operate, for if you do so earlier bad results are almost certain to follow.

The SCORBUTIC ULCER is a form which we occasionally meet with in practice. It arises during the progress of scurvy, and is therefore found amongst those who are most liable to be affected with that disease—namely, sailors or the navvies employed on railways. These men live mostly on salt provisions, seldom tasting either milk or vegetables, and thus, whether landmen or seamen, they soon become affected with scurvy. I have seen the disease occur on board ship, even where the necessary precautions regarding diet had been used, and a plentiful supply of lime juice, preserved milk, and vegetables provided, but in such cases it arises from special conditions, as close confinement, bad air, and debilitated constitutions.

True scurvy begins in a somewhat peculiar way. The symptoms are at first those of languor and weakness ; at length uneasiness almost amounting to pain is felt, and attention is drawn to a peculiar ecchymosed appearance generally over the front of the tibia. This condition precisely resembles that which might be produced by a bruise. Its colour deepens towards the centre, and gradually shades off towards the circumference, the surrounding skin being of a yellowish hue. The limb is some-

times slightly cedematous, but presents no breach on the surface. By and by patches of a similar kind make their appearance on other parts of the body. The pulse becomes weak, the gums spongy and tender, and there is often bleeding from them and from the nose, with fœtor of the breath. Over one or other of the affected parts, the skin at length gives way, and a scorbutic ulcer is formed. The ulcer, although weak from the first, extends very rapidly, so that it may, within forty-eight hours, assume rather formidable dimensions. Bleeding takes place from the surface from time to time, and at length a large fungoid mass protrudes from the centre, having the appearance of boiled liver—or “bullock’s liver,” as it is sometimes called by sailors—and consisting chiefly of imperfectly clotted blood, the fibrine being thrown out, and formed into a spongy mass. The surface of the sore presents an unhealthy brownish appearance, and the patient complains of great lassitude and weakness.

The treatment of the scorbutic ulcer must be almost entirely constitutional, so as to get rid of the depraved condition of the system which gives rise to it, for until this be effected, local remedies are of no use whatever. As the cause is generally improper diet, so the cure must consist in correcting that defect, and with this view we administer milk and fresh animal and vegetable food, together with fresh fruit—such as oranges and apples, if obtainable—and acidulated drinks, such as lime-juice, or other vegetable acids diluted with water. The administration of fresh vegetables should be guarded at first, as they are apt to produce diarrhœa. Slight stimulants may be given in the form of light wines, and of these claret is the best. Under this treatment the symptoms of debility soon pass away, the ulcer ceases to bleed and assumes a healthy character, the fungoid mass drops off, and the part may be afterwards treated as an ordinary healing sore. Should bleeding occur from the surface of the ulcer during its progress, either spontaneously or from improper attempts to remove the fungoid mass, it ought to be arrested by the application of some styptic preparation, such as tincture of

perchloride of iron or tincture of matico. The epistaxis, if troublesome, should be arrested by plugging the nostrils. In this disease comparatively slight exertion on the part of the patient may be followed by fatal syncope, and hence great caution is required.

Another form of ulcer arising from a special cause is the VARICOSE ULCER. This possesses the characters of a weak or indolent sore. It generally occurs on the legs, and always in connection with dilated and varicose veins. In these the blood accumulates, the circulation is retarded, and the proper nutrition of the limb is thus interfered with. Œdema takes place in the neighbourhood of the affected veins; this leads to undue pressure, hence to loss of vitality, and at length to ulceration. In the first stage the ulcer so produced has a slightly raised margin. Its surface is brownish in colour and unhealthy in appearance, and its action is weak. Gradually the œdema increases, the infiltration becomes more solid, the limb becomes unshapely and the sore gradually assumes the appearance and character of a callous ulcer.

When we have to treat an ulcer of this kind, the patient should be placed in the recumbent posture and the limb slightly raised, so as to favour the venous return. Local support should be afforded by means of a bandage applied round the limb from the foot upwards, so as to aid the circulation and promote absorption. The ulcer should be treated by the application of black wash to the surface, and in some cases this may with advantage be preceded by the use of nitrate of silver. Under such treatment the sore will heal rapidly in most cases. The black lotion in particular seems to possess an almost specific action, but occasionally the chlorinated soda or chloride of zinc lotions may be used alternately with it. If the ulcer assumes an indolent form, it should be treated in the manner already indicated for the cure of indolent sores. After being healed, such ulcers are very liable to break out again, as the varicose condition which gives rise to them can seldom be completely remedied.

The patient, therefore, should be warned of the danger, and instructed to wear an elastic stocking, either plain or laced—I generally prefer the latter—so as to give support to the returning column of blood. The special treatment of varix will be considered hereafter.

## LECTURE XI.

Sloughing Phagedæna or Hospital Gangrene : its nature and varieties—Acute or Black Phagedæna : appearance and mode of development ; its rapidly destructive course ; the Febrile Condition which accompanies it—Grey Pultaceous Phagedæna : contrasted with the foregoing, both as regards its Local Appearance and Constitutional Symptoms—The causes of Phagedæna : endemic, Epidemic—Practical hints and details with regard to Hospital Ventilation—Treatment of Phagedæna.

THE PHAGEDENIC OR SLOUGHING ULCER is characterised by the rapidly destructive nature of the process, and forms the connecting link, as it were, between ulceration and mortification, so that it is sometimes spoken of as ulceration, at others as gangrene, as in the case of Hospital Sore or Hospital Gangrene.

Phagedenic ulceration presents itself under two forms, both equally dangerous, but differing in their local and constitutional symptoms. The more acute form, the BLACK PHAGEDÆNA, shows itself by the appearance of small vesications, containing a very dark serum, on the margins of some existing sore or wound ; or by some of the granulations in the centre suddenly becoming of a deep purple or black colour, and by the purulent secretion from the surface becoming fœtid, altered in appearance, or altogether arrested. From the parts first affected by the dark vesication or black spot, the action quickly spreads, the edges of the sore become black or purple and slightly everted, the neighbouring integuments assume a dark dusky red hue, without any circumscription, and become either tense and glazed, or else the swelling is soft, boggy, and diffuse. The granulating surface becomes affected and assumes the appearance of an ash-coloured or greenish, occasionally dark brownish-purple or black slough. The margins give way, enlarging the ulcer with extreme rapidity, and the black edges involve the neighbouring skin in the diseased action, so that in a few hours

great destruction of tissue may occur. In some cases of black phagedenic chancre on the prepuce, the whole integument of the penis, and occasionally even large portions of that organ, may slough in the course of twenty-four hours. As the ulceration or sloughing extends, some of the enlarged subcutaneous vessels may be opened into without time being given for hæmostatic changes, and very considerable loss of blood may occur. Occasionally when this takes place the surrounding tension and redness diminish and the action is arrested for a time or altogether.

These local conditions are either preceded or accompanied by very marked constitutional symptoms of a febrile character, but these are rather of the irritative type, as in most inflammations of the erysipelatous form. There are rigors, violent headache, generally referred to the supra-orbital region, nausea, and occasionally vomiting of bilious or greenish-coloured matter. The tongue is foul and furred, with red edges, but dry and brown in the centre; and the pulse feels full and bounding, but after a short time becomes easily compressible. In the advanced stage we have perspirations, diarrhoea, and great prostration.

The other form of phagedæna presents different characters, both as regards the local appearances and the constitutional symptoms. From the appearance presented by the surface of the sore it has been named the GREY PULTACEOUS PHAGEDÆNA. It is more insidious in its mode of invasion than the black phagedæna, and as it is the form which most frequently attacks operation and other wounds, it is well to note its usual progress. On examination it will be found that the patient has been out of sorts for a few days before anything was noticeable in the wound. There have been chilliness, quick pulse, foul tongue, and loss of appetite, and want of sleep or disturbed sleep. The edges of the wound or sore become infiltrated, swollen, and everted, and the surface appears as if covered with a soft granular deposit of a dirty grey colour. Soon after these appearances are observed, the limb or other part becomes swollen, often very tense, of a light pink tinge, which is deeper at the margins of the sore; in some cases there is no redness at all, the swollen limb



being of a pale yellow colour. The pulse now rises, varying from 100 to 130 or higher, weak and often irregular even at an early period, and the patient is feeble and irritable, and perspirations occur from time to time.

The local changes proceed very rapidly, the edges of the wound separate, the tissues appear as if infiltrated by the grey exudation, hence the surface enlarges with great rapidity. I have seen a stump of the thigh which was nearly healed open up completely in less than two days after it was attacked with this form of diseased action. At the same time, however, this form of phagedæna does not seem to cause such a loss of substance as the black form; the skin seems to be rather pushed aside than destroyed, as I have seen stumps and large ulcers heal with very small cicatrices, after the action was arrested, although in some cases, when it attacked venereal buboes, I have known it produce great destruction of skin tissue. The constitutional symptoms are certainly characterised by greater debility than those which accompany black phagedæna.

The causes which lead to this formidable disease are generally either endemic or epidemic. Occasionally we meet with sporadic cases, depending either on some unhealthy tendency in the individual, want of cleanliness, or from improper irritating dressings having been used, most likely from a combination of all these conditions; but by far the largest number and best-marked cases arise either from endemic or epidemic influences.

Examples of endemic causes, or those which originate and are developed in some particular locality, are those where the atmosphere pervading a house, hospital, or district, is contaminated by the effluvia due to bad sewage and bad ventilation, or the gradually accumulating vitiated air in rooms or wards where several patients are more or less constantly confined, as in large hospitals, especially where there are many surgical cases under treatment. Indeed, so generally is this last example of endemic influence recognised, that phagedæna is often denominated hospital sore, or hospital gangrene. As

an epidemic, phagedæna occurs very generally at seasons when erysipelas, scarlatina, and diphtheria prevail. These causes should be carefully kept in mind, both in regard to prophylaxis and treatment.

The epidemic causes not being under our control, a knowledge of them is chiefly of use as guarding us against performing any operation we can possibly avoid during the prevalence of any of the epidemics formerly alluded to. But in reference to the effects of irritating dressings, or the endemic influences, these, being greatly under the control of the surgeon, should be very carefully attended to, so that they may be diminished or altogether obviated. Thus, great care should be taken as regards cleanliness—all old dressings taken away and burned. The use of sponges to wash sores or wounds should be scrupulously avoided, tow being used instead, and the tow of course destroyed after the dressing. Dressings should be light and unirritating, and in warm weather they should be sprinkled with some antiseptic fluid.

In hospitals, or other places temporarily used as hospitals, overcrowding the wards should be prevented, and sufficiency of air be thus obtained for each patient.

Great attention should be given to proper drainage and ventilation—the latter by natural means, such as windows and open fire-places. Mechanical methods of ventilation—such as heated shafts for extracting the foul air—are almost always disappointing, their success being usually in the inverse ratio to the amount of ingenuity displayed in the arrangements, and the complexity of the apparatus. I had the misfortune to experience this in my own hospital practice shortly after I took charge of the Senior Surgeon's wards in the new Surgical Hospital. These wards had only then been in use for about three years, and had been arranged as model wards, and ventilated on the purest and most approved scientific principles.

Notwithstanding this, it had been noticed that cases did not go on so favourably as in less favoured localities; and two or

three weeks after I had removed my patients into these wards, first some stumps, which were nearly healed, took on an unhealthy action, and soon all sores and wounds presented the characters of either the black or grey phagedæna. The slightest abrasion or cut was infallibly attacked by the diseased action, which was most intractable. The patients were removed to a small reserve hospital on the grounds, occasionally used as a fever-house; and though not perhaps a model hospital, the change of locality acted like magic on the patients. The sores began to amend almost from the time of the removal; and ultimately every patient who had been removed made a good recovery. Indeed the only two fatal cases occurred at the commencement of the outbreak, and these were originally amongst the most trivial wounds—one a case of simple fracture of the thigh, with slight abrasion over the knee. The case had been under treatment about a fortnight when the abrasion presented the appearance of black phagedæna, and resisted all treatment. In the other fatal case, the phagedenic action followed upon an incision of the prepuce, for phymosis, in a man of worn-out constitution. Careful investigation showed how very imperfect the removal of the vitiated air must have been. And now that natural ventilation by the windows and air-chambers, by the ventilator in the roof, and open fire-places, has been adopted, and other changes made in the arrangement of the wards, I have not for many years seen phagedenic sores unless when brought into the house from without, or occasionally when unhealthy tendencies prevailed generally in the city and neighbourhood as epidemics.

I think it right, however, to express my opinion that we must not trust implicitly, even to the best arranged and ventilated wards, to the exclusion of other precautions. I have noticed that the best wards are not unfrequently those in which unhealthy conditions manifest themselves; and the cause is not far to seek. Being the best, they are the wards in which, for obvious reasons, we place our operation and other important cases, and after a time our favourite ward becomes the scene of some unexpected

unhealthy condition. We must remember that many of the causes of the vitiation of hospital wards are cumulative, and hence I have for many years been in the habit of clearing out a ward at short intervals, if only for a few days, and having it washed and thoroughly fumigated, either with chlorine or sulphurous acid fumes, and then all the windows kept open for thorough ventilation; and from experience I can strongly recommend the general adoption of the plan.

The treatment of phagedæna naturally divides itself into the local and general, and requires to be modified according to which of the two forms the disease assumes.

The local treatment in both forms consists in destroying the diseased surface, and then using antiseptic applications with the view of preventing the spread of the action. This indication is effected by the use of strong caustics, such as nitric or sulphuric acid, or even the actual cautery. I have tried all of these, and found the cautery to be generally followed by the rapid extension of the disease, so that I abandoned it, and used the mineral acids as better suited for the purpose, their destructive action being more limited, the effects of the cautery apparently diminishing vitality in the surrounding tissues. In the grey phagedæna, or in ordinary foul sores, I prefer the application of a saturated solution of chloride of zinc, applied as a caustic, which acts also as a powerful antiseptic. In both forms of the disease I have found that wood charcoal poultices answered better than almost any other antiseptic remedy in deodorising and promoting a healthy action in the sores. But in many cases I have seen great advantage from the use of carbolic acid paste applied to sores of a phagedenic character, followed by the use of a dilute watery solution in warm water dressing. The amount of inflammatory redness and tension in cases of black phagedæna, and the benefit which sometimes occurs from accidental hemorrhage in such cases, might lead us to expect benefit from incisions; and some have even recommended this, but the risk of the incisions becoming new centres of diseased action, has always deterred me from venturing to try it, and I believe we can relieve the local inflam-

mation with less risk by constitutional remedies, such as antimonials and opium.

It is in the general treatment of the two different forms of phagedæna that we require to exercise the greatest discrimination. In black phagedæna there is, in the earlier stages at least, violent local action, and hence we require to exhibit small doses of antimony with opium, or minute doses of belladonna or aconite, giving, at the same time, farinaceous and milk diet where the patient can digest that, and as far as possible avoiding wine or other stimulants ; but at the same time we must recollect that by and by the blood-poisoning will induce typhoid symptoms, so that we must not carry the antiphlogistic treatment too far. In the latter stages of the black phagedæna, and from the first in the grey form, great benefit will be found to accrue from the use of tincture of muriate of iron or the sulphate of quinine, after the digestive organs have been attended to. The diet also will require to be more generous than in the early stages of black phagedæna. In many cases opium requires to be exhibited largely, and seems less productive of bad consequences, or interference with the digestive organs, than under ordinary circumstances.

When the disease appears as a result of endemic causes, as in hospital practice, no treatment can be expected to be of use so long as the originating cause is in operation—the patients must, as soon as possible, be removed elsewhere, to tents, or sheds, or any accommodation that can be obtained till the wards are thoroughly cleaned and ventilated.



## LECTURE XII.

Mortification or Gangrene : its phenomena, causes, and varieties—Acute or Humid  
Gangrene generally of traumatic origin : its symptoms and manifestations—  
Treatment must be regulated according to the cause—Question of Amputation  
in Traumatic Gangrene.

MORTIFICATION or GANGRENE is complete and extensive death of a part. It may result from inflammation, or from injury. As a result of inflammation, it may be due to the amount of the exudation and the rapidity with which it is poured out, interrupting nutrition by causing pressure on textures, while there is often rupture of some of the congested capillaries or small bloodvessels, leading to extravasation of blood into the cellular tissue. The pressure of this, along with that of the exudation, interferes with the vitality of the part. The blood, exudation, and surrounding tissues, become disorganised; they undergo decomposition, gases are evolved from them, alteration in colour takes place under the integument. If the skin be not broken, extrication of the gases into the surrounding cellular tissue occurs; further discoloration takes place; and the blood-poisoning resulting from these local changes hastens the progress of the constitutional symptoms. Generally we have it in an intense form, when the vitality of the part has been diminished by local causes, such as injury, or the continued application of cold; or where the debility arises from some constitutional cause, either in the state of the bloodvessels, or one of a temporary character, such as debility following upon fevers. In such cases, reactionary inflammation or irritation of a part is very apt to be followed by gangrene.

Gangrene or mortification is divided into two principal forms—the *Acute*, humid, or traumatic gangrene; and *Chronic*, or dry gangrene. In the acute form the action proceeds very rapidly, and the fluids have not time to pass out of the textures before



MORTIFICATION.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



their death. In the chronic form the gangrene supervenes slowly, and is not always or generally attended, either by the same violent local action, or by the same severe constitutional disturbance. It arises from a variety of causes, and is modified according to the cause.

The best example of the ACUTE or HUMID GANGRENE is that arising from injuries. Extravasation of blood takes place, possibly from rupture of some of the more important vessels at the moment of the injury. Inflammation sets in; exudation and serous effusion are poured out, giving rise to increased swelling and tension, by which the circulation is impeded. In traumatic gangrene of the leg, the limb appears somewhat swollen and of a purplish or mottled colour; at first its temperature is slightly raised, afterwards, however, it falls, and the foot assumes a livid appearance; inflammatory action begins on the proximal side of the injured part, the injured parts and those on its distal side alter in colour; the former become very dark, the latter become grey or ash-coloured. At and beyond the injured part vesications occur, filled with a dark-coloured fluid (*phlyctenæ*). When a certain amount of inflammatory action precedes, they are well marked; but when the vitality of the part has been very rapidly destroyed after reaction, the vesications are not so well seen. They depend on the separation of the cuticle, and the effusion of dark-coloured serum between it and the true skin. They are not well marked if the skin has been much lacerated, for then the fluid escapes. When the disease progresses very rapidly, this separation of the cuticle does not take place; the parts directly injured become dark and dead, those beyond retain a certain degree of vitality; all the neighbouring parts have a peculiar puffy appearance, and on pressure there is a feeling of crepitation, owing to the emphysema—that is, the presence of gas in the cellular tissue. The humid character of the gangrene is due to the tissues having died while still retaining their fluid contents. The swelling is the result partly of effusion, partly of the extrication of gases.

When the gangrene ceases to extend, a line of demarcation is formed between the dead and the living tissues; this line becomes a deep furrow, which slowly separates the completely dead from the living parts.

Along with these local symptoms of acute gangrene, we have certain constitutional symptoms present. The irritative fever which is set up varies in its intensity. In the first stage of reaction, after such an injury as I have described, the pulse rises, the skin becomes hot and feverish, the tongue foul but not dry, still, however, with a tendency to become dry at the back part. The pulse very soon loses its fulness and force ; in most cases it becomes soft. The fever becomes irritative, and then delirium sets in. Delirium shows itself first by a tendency to wandering at night, and then becomes constant and more violent in character. This form of delirium is that known as *delirium traumaticum*. Next, the tongue becomes dry, the pulse more frequent and compressible, the features sharp and of a leaden hue, the eyes sunken ; cold clammy sweats set in, at first partial, then over the whole body. There is vomiting and hiccup—the latter being a very marked condition, especially in hernia when part of the bowel becomes gangrenous. Such are the general symptoms of acute gangrene. The local phenomena are due, either to sudden disintegration of the parts, or the interruption of the circulation by the violence of the injury, or more slowly to the inflammatory action which results ; the part being so debilitated that it cannot resist death when inflammation sets in.

The grey appearance is that which first results in the decomposition of tissues containing little or no blood. The black appearance is, in the first instance, due to a deoxidation of the colouring matter of the blood, or to special compounds formed by the action of the liberated gases upon it, and finally to its complete decomposition and that of the tissues. The constitutional symptoms may be due to a form of blood-poisoning, the result of absorption by the vessels either of the poisonous gases which come off, and which do not get free vent externally, or of the putrid fluids. The constitutional symptoms in traumatic gangrene are not always intense in proportion to the violence of the injury or the complete death of the part. Very much depends on the health of the patient. If the constitution

be good, and the cause of the gangrene be distinctly local—that is to say, if the violence of the injury is quite sufficient to account for destruction of vitality in the injured structures—these symptoms may at first be very slight, as was the case in this gangrene of the hand. But if the patient be of a weak constitution, the gangrene which sets in after an injury will have all the constitutional symptoms in great intensity, because there is, as it were, a constitution ready to be affected by a comparatively slight cause. Hence, when the marked constitutional symptoms come on after a comparatively slight injury, we may infer that the constitution in such a case was debilitated.

Another condition affecting the intensity of the local or constitutional symptoms, is the importance of the part injured. Sometimes a large slough separates without much harm being done, as when a fascia sloughs. But if the gangrene be in an important texture, such as a portion of bowel, even though only a small part of it be affected, all the constitutional symptoms come on in a most intense form.

As I have told you, acute gangrene may be due to injury. The injury alone may be so violent as to destroy the part, or it may be less severe, and an unhealthy condition may determine gangrene instead of healthy action. Acute gangrene of a very intense form may also result from extravasation of acrid fluids, such as urine, into the cellular tissue or into certain organs. In extravasation of urine in cases of stricture, the whole textures die in the course of a very few hours. From almost the first there are marked and intense constitutional symptoms—pulse weak, wandering, and then violent delirium; the debility and irritative fever proceed very rapidly, though only a small amount of fluid be extravasated. These symptoms of urinary infiltration are just the symptoms of gangrene.

The *Treatment* of acute gangrene must greatly depend on the cause. If the cause be constriction of the tissues, as in hernia, the main indication is evidently to relieve the constriction. In a case where gangrene is imminent, from tight bandaging, of course remove the bandage, and then, if necessary, make in-

cisions so as to relieve the tension, get rid of the sloughs, allow the escape of the gases which may have been formed, and so give a chance of recovery. After the incisions, apply charcoal poultices to the part affected.

In extravasation of urine, it would do no good to pass a catheter and draw off the urine ; it would certainly prevent further extravasation, but it would not affect the textures injured by the urine already extravasated. The treatment is obviously to make free incisions in the scrotum and perineum, or other part, in order to allow the extravasated urine and sloughs to escape. In cases of gangrene, generally, where there is any tension, we make incisions into the part to allow the exudation and gases to escape. And by making free cuts through the slough we do good, because it often forms a sort of mechanical barrier to the escape of the putrid fluids below it.

In cases of acute gangrene we must be very cautious about giving stimulants at first. When the patient is weak, however, we require to give them in small but gradually increasing quantities, as well as opiates and nourishing diet. Ammonia may also be given in extreme cases to stimulate the patient, but not in cases of urinary infiltration, for it tends to render the urine alkaline, and thereby to favour its decomposition. During the irritative fever, we must avoid over-stimulation, which might excite the gangrenous process to greater activity ; and therefore we give nourishing but not very stimulating diet—such as farinaceous with a little animal food. The excretions must of course be attended to.

As regards the question of Amputation in Traumatic Gangrene in cases of acute gangrene, where the violence of the injury has been of such a kind as quite to account for the loss of vitality of the part, there can be no hesitation as to the propriety of the operation. Where the part is quite gangrenous we should amputate at once, before constitutional symptoms have set in, because if we leave it alone the gangrene will certainly spread, and irritative fever afterwards supervene ; or if we wait for nature to form a line of demarcation, the patient's



strength will be worn out, and we will have to amputate much higher up the limb than we might have done before. In this case, there is no advantage in postponing the operation, as the part is past recovery, and the sooner it is got rid of the better. Should, however, the history of the case, the nature of the injury, and the constitutional conditions, lead us to suspect that the gangrene does not entirely depend on the injury, the question of amputation becomes more difficult. The case is unfavourable in any way; still if, after making free incisions to relieve tension and allow the gases and fluids to escape, and the use of antiseptic poultices, the gangrene continues to spread, the safest plan is to amputate early, without waiting for a line of demarcation. Even though the gangrene be spreading, I believe the best chance for the patient is to amputate, but in doing so we must cut very wide of the apparently diseased textures.

## LECTURE XIII.

Chronic or dry Gangrene : its causes and treatment—Senile Gangrene of Pott—Evils of former mode of Treatment by over-stimulation—The more rational mode now adopted—Gangrene arising from Ligature of a Vessel—General recapitulation of the question of Amputation in the different forms of Gangrene.

CHRONIC GANGRENE is generally, though not always dry. The constitutional causes may be temporary or persistent. Temporary causes are seen after scarlet or typhus fever, when there is a tendency to form bed-sores. These are patches of gangrene formed over the buttock or other part upon which the patient has lain long ; the gangrene is due to pressure and the diminished vital power. Chronic gangrene of the toes and feet often arises from the febrile excitement and debility resulting after fever, and here, the cause being only temporary, the constitutional symptoms do not come on if proper treatment be adopted. The constitutional causes may, however, be persistent. They are very different from the temporary causes. In some cases embolism is the cause. Embolism is the plugging and consequent occlusion of vessels produced by either clots of blood or growths from the valves of the heart being driven from the heart into the smaller vessels. Or there may be some inflammatory affection of the coats of the bloodvessels, leading to their occlusion. In these cases the irritative fever is very marked. The constitutional symptoms are often absent or slight in chronic gangrene arising from temporary causes ; and the gangrene has a tendency to spread ; so that we cannot operate in such cases, because we do not know where the cause—the obstruction of the vessel—may be. In chronic gangrene resulting from constitutional causes of a temporary character, as after fever, the local treatment is limited to applying a poultice, not too warm, to the part, or keeping it wrapped up in cotton wadding so as to preserve its temperature, and avoid-

ing any external stimulation, in case it should hurry on the diseased action. As regards the constitutional conditions, tonic remedies are to be used. After a line of demarcation has formed, and when the patient's health is so far restored, amputation of the diseased part should be performed—but higher up the limb than the line of demarcation, so as to form a good stump. Amputation is proper in such cases, because there is no tendency for the stump to be affected by gangrene, the causes being only temporary.

In chronic gangrene resulting from persistent constitutional causes the treatment is different. It may be due to obstruction or disease of the bloodvessels of the part, and the inflammation so set up. Or there may be a deposit in the coats of the arteries impeding the circulation. The Irritable form of chronic gangrene is of this kind. In it the disease is attended with a good deal of local inflammatory action ; some of the fluids are retained in the dead part, and there is constitutional disturbance.

There is another form of chronic gangrene, in which the parts become quite dry and shrivelled, and where there is none of the local irritability that exists in the irritable chronic gangrene. The disease begins at one finger or toe and spreads from it to the others. The parts dry and shrivel up and give off all their fluids. There is thus less chance of blood-poisoning, and the constitution suffers very little, and sometimes only slight pain is experienced. The change seems to take place so slowly that the fluids are expelled before the death of the part, and so less rapid disintegration occurs and there is less constitutional disturbance.

The constitutional *treatment* is here very slight. If the patient cannot sleep, opiates are to be given, along with nutritious and perhaps slightly stimulant diet, because there is no over-action of the diseased part ; but beware of too much stimulation, lest you excite over-action in the dying part. The local treatment consists in wrapping the limb in cotton wadding, and placing it so as to favour the circulation. Here, as in all cases of gangrene, we must not apply any local stimulus, such as heat or stimulating liniments, to the part, as we might thereby bring on a more irritable action. All pressure on the limb is to be

avoided; it should therefore be placed on a water-pillow. This form of chronic gangrene often arises in old persons of a gouty or rheumatic diathesis, and is usually called *Dry Senile Gangrene*.

The SENILE GANGRENE of Pott is an irritable form of chronic gangrene, in which there is violent local action, with diminished vital power in the system. The patient may be rather plethoric, and used to free living, and then a very slight exciting cause may lead to the gangrene. This form of gangrene generally attacks the foot. It commences not unlike the dry senile gangrene, but it is always attended with a considerable amount of local excited action in the vicinity of the gangrene. There is redness, swelling and puffiness from the exudation, and on the dorsum of the foot there is a great deal of weak inflammation—*inflammatio debilis*, as it is called. The general constitution may sympathise; the pulse becomes quick, the skin hot and dry, tongue foul, and urine scanty, intense pain in the part affected and want of sleep at night, and also a throbbing feeling in the whole limb, and all the symptoms of irritative fever. There is, in fact, as I have already said, violent local action, with diminished vital power, and an irritable state of the constitution.

The *Treatment* was formerly based on the idea that the disease was due to debility, and that therefore the patient required great stimulation; so strong soups were given with much animal food, brandy and strong wines, and large quantities of powdered Peruvian bark as an antiseptic. The effect of all this was to over-stimulate the patient, impair the digestive organs, and thereby cause the local disease to extend with great rapidity—almost as rapidly as acute traumatic gangrene. All this arose from the treatment. Mr. Pott was the first to point out that the disease was one of irritability, and not altogether of debility, and that therefore the use of stimulants was wrong, as leading to over-stimulation of the weak part, and to greater rapidity in the progress of the gangrene after it had set in. He showed that nothing should be given to stimulate the part or the constitution. The proper course is to allay the irritability by

the use of opiates internally, and to avoid all over-stimulation of the patient, giving enough food for nourishment and of a kind easily digested—such as farinaceous food and milk. In this disease the opiates are not found to interfere so much with the digestive organs as they usually do. No bark should be given, at least in the earlier stages. The local treatment used to consist in scarification and the application of hot dressings and stimulating ointments, to excite the part and hasten the separation of the sloughs and gangrenous parts. This generally terminated in increasing the gangrene.

The local treatment adopted by Pott was very different. He wrapped the parts affected, and indeed the greater part of the limbs, in cotton wadding, so as to maintain the temperature, and endeavour as much as possible to avoid pressure on the limb and favour the circulation in it ; but he avoided all stimulants, either local or general. This is the true principle of treatment, and it is found to be far more successful than the former plan of stimulation, by which the disease was quickened and caused to spread. Under non-stimulating treatment the gangrene generally ceases, and a line of demarcation forms sooner, and so there is a greater chance of recovery. The patient may be so weak, however, that stimulants are absolutely required, but experience must guide us in deciding in special cases.

As to amputation in constitutional gangrene.—In cases arising from a temporary constitutional cause, such as that occurring after a fever, we amputate above nature's line of demarcation. But where the constitutional causes are persistent we should not amputate at all ; even after a line of demarcation has formed we should not interfere, beyond dividing a dead tendon or piece of skin, so as to let the part drop off sooner. We should let nature form a stump of her own. Interference only renders the gangrene irritable, and causes it to spread more rapidly. We cannot tell how far the vascular system is affected in such cases, and very little local irritation will set up diseased action afresh. When the cause is embolism, or arrestment of the circulation from inflammation of a vessel, we may after a time amputate ; but we



must wait long enough to know exactly where the diseased action has ceased.

The best example of chronic gangrene arising from a local and temporary debilitating cause, is that resulting from cold. In such a case, we cannot tell how far the cold has affected the limb. That cause is generally in operation along with others, such as want of food, or other great hardships. This form of chronic gangrene is not attended by very great constitutional disturbance. The part seems simply affected by depression of the circulation from the cold. After reaction, the effusion which takes place gives rise to still further obstruction of the circulation, and death of the part follows. It is generally the feet or hands that are thus affected.

The treatment consists in giving the patient nutritious diet, cautiously avoiding stimulation, and wrapping the limb in wadding. Or a charcoal-poultice, not much above the temperature of the sound part of the limb, may be applied to prevent fœtor and favour separation of the dead parts. In cases of this kind amputation should ultimately be performed ; but we must wait till the line of demarcation is thoroughly formed before doing so, for we cannot otherwise tell how far the cold has exercised its fatal influence. I remember a case of gangrene arising from cold—of which I show you a sketch—in which a deep line of demarcation formed on the dorsum of the foot, but not on the sole. Well, amputation through the tarsus was about to be performed, when suddenly the gangrene, which seemed to have ceased, attacked the heel and spread from that to the front of the foot, and not for some time afterwards was there a complete line of demarcation formed above the ankle, so that amputation could be performed through the leg. Remember, then, that in such cases there is a tendency to the gangrene recommencing, and wait till complete demarcation takes place.

A peculiar sub-acute form of gangrene sometimes results after ligation of a vessel, such as the superficial femoral artery in cases of popliteal aneurism. The gangrene may supervene in the foot ; there is not usually much constitutional disturb-



ance, though in some cases there is more than in ordinary chronic gangrene. The local disease sometimes spreads very rapidly, extending even above the seat of ligature if allowed to proceed. In this class of cases we employ the ordinary treatment for chronic gangrene: maintain the temperature of the limb, prevent pressure on it, and support the patient's strength. But in this form of gangrene we know where the point of obstruction in the circulation is, and so when the gangrene spreads, and we see that amputation must be performed sooner or later, we should do it at once. We should not, however, amputate below the knee in gangrene after ligature of the femoral for popliteal aneurism, because the diseased condition which rendered the ligature necessary still exists, and there is a great tendency in the gangrene to spread up to the knee.

Some surgeons say that we should amputate above the ligature—at the trochanters, or at the hip; but there is no necessity for this. If the gangrene has not passed the knee, we need not go higher than the middle third of the thigh, or even the lower third. The obstructed vessel chiefly supplies the leg and foot, and there is still sufficient vascular supply left for the thigh by the deep femoral and other arteries. In gangrene arising from ligature of the femoral artery, we should therefore amputate, but not below the knee, nor above the middle third of the thigh, unless the disease has spread higher up before the operation.

I shall conclude this lecture by giving a general recapitulation of the rules for amputation in different forms of gangrene.

1st. In traumatic gangrene, where the violence of the injury is such as to account for the destruction and loss of vitality of the parts, amputate at once, and not necessarily very high up.

2d. In traumatic spreading gangrene, where the original injury was not sufficiently severe to account for the gangrene, and where we therefore suspect the constitution, and that some debilitating cause is co-operating with the injury, and where the gangrene is spreading, amputate without waiting for a line of demarcation. It is not a favourable case any way, but the best

chance of recovery is given by early amputation. In this case amputate very wide of the gangrene.

4th. In chronic gangrene, arising from constitutional causes of a temporary character, wait till the general health is re-established and a line of demarcation thoroughly formed, and then amputate higher up to make a good stump.

5th. In gangrene resulting from cold the same rule applies.

6th. In gangrene resulting from constitutional causes of a persistent character, do not amputate at all—let nature form the stump—do no more than snip through dead tendon or ligament.

7th. In gangrene after ligature of the main vessel of a limb, if the gangrene be decided and is spreading, amputate at once. If the superficial femoral artery has been tied, amputate at the lower third of the thigh, for the branches of the profunda and their anastomoses are quite sufficient to nourish the parts forming the stump.

## LECTURE XIV.

Erysipelas : its symptoms and appearances—Idiopathic and Traumatic Erysipelas—  
Distinction between Erysipelas and Phlegmon—Erythema, Erythema erratica  
—Bilious Erysipelas—Phlegmonous Erysipelas—Edematous Erysipelas—  
Erysipelas of the Head and Face—Origin, terminations, and prognosis.

ERYSIPELAS is a peculiar inflammation of the cutaneous structure. It is a disease the knowledge of which is of great importance to the surgeon, for in certain states of the constitution, and under certain circumstances, as when it prevails epidemically, we find it thwarting his best-designed operations, and converting the most trifling into serious injuries. Erysipelas may attack any part of the surface, and the general appearances and characters of the inflammatory action and its termination are modified by the nature of the part in which it occurs.

In those forms of the disease where the inflammation is limited to the skin, it is characterised by bright redness of a lake tinge. This redness is not circumscribed but diffuse, the colour gradually fading into that of the surrounding skin. On pressing the part with the point of the finger, it becomes pale, the cutaneous capillaries being for the moment emptied by the pressure, but as soon as that is withdrawn they immediately refill, and the redness again returns. There is little or no tension in the part, and the pain is of an itching and burning character. As the capillaries cannot relieve themselves by effusion into the skin tissue, the serum is exuded between the true skin and cuticle, causing vesications. Where the inflammation of the skin is in the neighbourhood of parts containing much loose cellular tissue, into which the vessels can relieve themselves by effusion,—there is often a great amount of infiltration or serous effusion into the cellular structure, and the surface in these cases pits on pressure.

Erysipelas may be either *idiopathic* or *traumatic*. The former arises from some epidemic or constitutional cause, and the latter results from some external wound or injury. Generally, however, there are evidences of constitutional disturbance prior to the appearance of the cutaneous affection; so the probability is that, even when it supervenes upon, or seems to be induced by, an external injury, some constitutional exciting cause must be at the same time in operation. The premonitory symptoms, too, are alike, whether the cause be idiopathic or traumatic; they consist generally of chilliness, rigors, nausea, headache, and not unfrequently an attack of vomiting or diarrhoea.

The distinguishing marks between erysipelas and pure phlegmon are, that in erysipelas the inflammation is more diffuse and tends to spread over the surrounding surface, whereas in phlegmon it is limited to the part where it began, which portion only becomes swollen. But the best diagnostic mark, perhaps, is that phlegmon is always defined by a hardened boundary, from the effusion of coagulable lymph into the surrounding cellular structure, whilst in erysipelas the swelling is diffuse.

The inflammatory action in erysipelas being confined to the skin, swelling cannot occur to any great extent, but effusion takes place beneath the cuticle and puffs it up into small vesications. When the inflammation of the skin begins to subside, then soft swelling often takes place, in consequence of the vessels of the part relieving themselves by effusion into the subjacent cellular tissue. A very constant and characteristic symptom of erysipelas is a tendency to wandering and delirium at night; this occurs often even in the slightest cases.

So much for the general characters of erysipelas; but as it presents itself in a greater variety of circumstances and conditions, it is necessary that we should examine these states more particularly. The disease used formerly to be divided into several different species, according to the symptoms or terminations of the inflammatory action. But we will simplify the subject, without losing anything of practical utility, by consider-

ing it under the several heads of ERYTHEMA—*Bilious*—*Phlegmonous*, and *Edematous* ERYSIPELAS.

By the term ERYTHEMA is understood that form of the disease which consists of mere redness or erysipelatous blush of the skin, followed by efflorescence without swelling or vesication, and accompanied in general by only very slight constitutional disturbance or fever. It is attended with a sensation of heat, which hardly amounts to pain, and it generally terminates in resolution. In some cases, however, the appearance of this erythematic blush after an operation, and more especially if it assumes the erratic form (*erythema erratica*), is indicative of serious mischief, and therefore ought not to be disregarded. In these cases the pulse becomes very quick, the tongue furred, and there exists a great tendency to the occurrence of typhoid symptoms. The erythema passes from the skin to the mucous surfaces; chiefly to the mucous membranes of the air-passages and intestines. It rarely passes from the scrotum or penis to the mucous membrane of the urethra, bladder, or kidney. In one case, in which I had removed the breast it passed to the lungs, giving rise to broncho-pneumonia. When the pulmonary symptoms ceased, erythema occurred in the thigh, and thence travelled up to the breast on the opposite side to that removed, but it never appeared near the wound itself. Afterwards it passed to the mucous membrane of the bowels, giving rise to acute dysentery. Ultimately the patient recovered. This case illustrates the metastatic tendency of the disease. Though it appears to be a trifling affection, yet it is really a very serious one; it is a pure blood-disease, and is attended with considerable danger.

BILIOUS ERYSIPELAS is ushered in with rigors. The colour of the affected skin is rather of an orange than a lake red, the tongue becomes foul, furred, and of a brownish-yellow colour; the eyes are dull and yellowish; and there are more signs of derangement of the digestive organs than in other forms of the disease. The cutaneous inflammation is preceded by a bitter foul taste in the mouth, nausea, and vomiting.

PHLEGMONOUS ERYSIPELAS is a much more violent form of the

disease, both in its local and constitutional symptoms, and can scarcely be regarded as being merely inflammation of the skin, for it extends to and involves the cellular tissue, and also the fascia. The swelling is more deeply seated and extensive than in any of the other forms. The pain also is more intense, and is of a throbbing burning character. The skin usually assumes a dark red hue, and there is great tension of the affected parts. The pulse rises in frequency to about 120 ; the general surface becomes hot and dry ; the tongue becomes dark in colour, and parched on the surface, with the tip and edges reddened and glazed ; the secretions are arrested ; there is want of sleep at night, and often acute delirium—all the symptoms, in fact, of severe irritative fever ; but the sickness and foul taste in the mouth do not usually come on until the violence of the disease begins to subside.

CEDEMATOUS ERYSIPELAS may either be simply the result of the vessels of the skin relieving themselves by serous effusion into the loose cellular tissue, where that tissue is abundant, or it may occur in old or debilitated patients, when the symptoms in general are those of a weak inflammatory cedematous state of the lower limbs ; and we also often find erysipelas supervening on anasarca, and then the parts involved assume this form of the disease. In such cases we have always a considerable degree of debility, complicated with low irritative fever, and this condition must never be lost sight of in the treatment.

Erysipelas of the head and face is a condition which is marked by very characteristic appearances. The scalp becomes red, tense, and painful, but there is little swelling owing to the density of the scalp tissues ; when, however, it spreads to the face, where there is great vascularity and abundance of loose cellular tissue, a great degree of swelling and consequent deformity rapidly take place. The fine cellular tissue of the eyelids becomes infiltrated, congested, and distended, so as to close up the eyes. The cheeks, lips, forehead, and parts over and under the jaw, next become swollen in succession. The action of the muscles, which give expression to the face, is both



# ERYSIPELAS



Fig 1.



Fig 2.



interfered with and obscured by the swelling, so that the whole countenance assumes a passive stolid expression, or rather want of expression, which we meet with in almost no other condition. In all cases of erysipelas, but more especially when the head and face are affected, there is a tendency to wandering and delirium ; and even in its slightest forms we may expect to find this present in some degree.

The causes of erysipelas may be epidemic, local, or constitutional. It may arise locally from injury, or from improper, foul, or rancid dressings to wounds or sores ; but probably, in almost every case, the disease is more or less dependent upon some exciting cause, either epidemic or constitutional.

It occurs most frequently in those who live freely, and indulge in the abuse of spirituous liquors. It is sometimes caused by mental emotions, which give rise to disturbance of the physical condition of the body. It may also arise from exposure to extremes of cold or heat. The latter is a very frequent cause ; and to this we may perhaps attribute the frequency with which erysipelas of the head and face attacks cooks and others whose occupations expose them to constant high temperatures ; perhaps, also, somewhat to their habits.

In certain states of the atmosphere erysipelas prevails very generally—most usually during the spring and autumn months. It has been remarked that puerperal fever and scarlatina often prevail at the same time ; and this, taken with the fact that attendance on one may communicate the other, inclines me to believe that a strong analogy exists between these diseases ; and midwifery practitioners are properly very cautious of attending on erysipelatous diseases.

Of the terminations of erysipelas the most desirable is resolution. When this takes place the redness gradually fades, the swelling subsides, the vesicles disappear, absorption progresses, the skin becomes shrivelled, and the cuticle speedily desquamates ; the constitutional symptoms disappear. Thereafter the parts gradually resume their wonted character and appearance.

When the inflammation has extended to the cellular tissue

underlying the skin, it may terminate in suppuration. Circumscribed abscess in erysipelas is by no means a rare termination, although it has been stated that it seldom or never occurs. I have seen it take place in the scalp, eyelids, hand, and arm, and it is not unfrequent in the lower extremities. Very generally, however, the collections of matter are more diffuse, owing to the want of a tendency to plastic exudation in the disease. In phlegmonous erysipelas the pus is thin, acrid, and of an unhealthy sanious character. It becomes extensively infiltrated throughout the cellular tissue of the part, dissecting the muscles, and separating the adjacent textures, in which it often leads to sloughing. During suppuration the overlying integuments assume a dark brownish colour, and impart to the touch a feeling of soft boggy fluctuation. This condition has received the name of cellular infiltration ; it is rather diffuse infiltrated suppuration, the result of phlegmonous erysipelas.

Prognosis in this disease must be based upon the constitutional condition and symptoms. It must be in all cases very guarded, for the most serious cases are often trifling and slight in their primary manifestations. It must be regulated partly by the history of the patient's previous habits as regards intemperance, and by his present state as regards age and debility, together with the character of the attack—whether acute or typhoid—its symptoms, and its site. In cases where the disease is situated on the head, and attended with great cerebral excitement ; or in the air-passages, and attended with dyspnoea ; or when it attacks the surface of the abdomen, and dysenteric symptoms supervene, the danger is very great. So it is also in all cases of extensive phlegmonous erysipelas, especially when attended with sloughing and discharge. Finally, in any case, if the pulse keeps high—above 100 for more than ten days—the prognosis is unfavourable.

## LECTURE XV.

Treatment of Erysipelas : must be modified according to the case—General Indications—Antiphlogistic measures to be adopted only in certain forms of the disease—Uses of Iron : of Cold and Warmth—When and how incisions ought to be made.

THE TREATMENT should, as a general rule, be antiphlogistic, but with certain reservations ; thus we must modify our antiphlogistic treatment according to the circumstances of the individual case, according as the action is sthenic or asthenic. We must also keep in view that when erysipelas prevails as an epidemic, its type often varies considerably from that of the epidemic which immediately preceded it. Thus, in some epidemics, we find that antiphlogistic treatment can be carried out actively and with success ; while in others the slightest amount of depletion proves hurtful, and the disease rapidly assumes a typhoid character. The general indications of treatment are to diminish inflammatory action when violent and well marked, and to allay irritation and febrile excitement. In young robust patients, where the constitution has not been impaired by dissolute habits, and where the febrile symptoms are violent, and assume the sthenic or inflammatory type, general bloodletting may be had recourse to ; but it is seldom that such treatment is indicated in this disease, and in the severer forms, where the surface is very much inflamed, the local depletion from incisions will be found in a great measure to supersede it.

In the majority of cases the constitutional treatment should consist of clearing out the stomach and bowels by the administration of emetics and purgatives. The best purgatives to use are mercurials followed by salines. The circulation should be lowered and diaphoresis favoured by minute nauseating doses of

antimony. Some recommend that antimonials should be combined with salines, but such a combination is objectionable—first, on account of the disagreeable taste, which causes the patient to take it reluctantly and irregularly; and, second, because the diaphoretic action of the mixture may be checked and interfered with by the exposure to cold which its purgative action necessitates. If antimony does not answer, or if there be gastric irritation or diarrhoea, I would recommend you to substitute ipecacuan in combination with morphia. Indeed, wherever there is great constitutional irritation, opium—unless contraindicated by its effects in regard to head symptoms—is a most useful remedy either alone or combined with antimony or ipecacuanha, but it should never be given until after the bowels have been well opened, nor when there are violent head symptoms with tendency to coma. In the latter stages of phlegmonous erysipelas, where diffuse abscesses have been opened and sloughs are being separated, opium is of great value to allay irritation, support strength, and procure sleep.

Though in phlegmonous erysipelas the treatment is at first antiphlogistic, both locally and constitutionally, yet as the disease goes on, especially when the sloughs are separating, we must support the patient's strength by stimulants and nutrient diet.

In œdematous erysipelas, on the other hand, the treatment should not be antiphlogistic; the limb should be bandaged from the foot or hand upwards, so as to give it support, friction with the hand to favour the returning circulation as far as possible, and the use of diuretics and alteratives to act on the kidneys, skin, and bowels, and assist the elimination of the fluids from the body, followed by the use of iron in moderate doses. From the amount of œdema and tension, it is necessary sometimes to make punctures in the part, but they are apt to take on a sloughing action; a slow form of ulceration takes place, which often proves fatal. It is a condition indicating low vital power, and is rather a symptom than a disease, and therefore punctures should not be made except in extreme cases, where the tension



is great. Stimulants do good in some forms of œdematous erysipelas, especially when it occurs in patients of dissipated habits. They are often indicated at an early period of the disease, more especially if the pulse be soft, tremulous, and quick, and the delirium of a low muttering character. Stimulants should be given cautiously, however, and their effects narrowly watched, and care must be taken at the same time that the bowels be properly regulated.

In all severe cases, during the latter stages, or so soon as the skin becomes moist and the febrile symptoms subside, or when typhoid symptoms appear, we should exhibit tonics, stimulants, and nutrient diet. Quinine, with mineral acids, wine, ale, or porter, are the best. The diet should consist of animal food ; but must be regulated according to circumstances. The patient must be cautioned against any violent exertion during convalescence, as fatal syncope sometimes occurs under these circumstances, as it does after severe fever.

During the progress of the erysipelas, preparations of iron are very beneficial, and during convalescence they should still be given, but then only at intervals and not continuously. By some, iron is considered a specific in all forms of the disease, but my experience warrants me in saying that the impression is erroneous, though in many forms of erysipelas it is a most valuable remedy. It should be given in moderate doses, say from 15 to 20 minims of the tincture of the perchloride four or five times a-day. I have found iron to be especially useful in cases of the erythematic form ; but when the disease assumes an acute character, and is accompanied with a quick full pulse, or in erysipelas of the head when there is a tendency to violent delirium, iron should not be given.

Great care and judgment are required in the use of local measures, such as cold and warmth. The application of cold has a tendency to lower greatly the vitality of the part, and is therefore objectionable in many cases ; but a stronger reason why it should be avoided is, that it may do positive harm, for as the local affection is, in general, only symptomatic, any agency

which would suddenly repel the action might induce metastasis to a more important part.

Warm or tepid lotions are pleasanter to the patient, and are attended with greater benefit. They soothe and relieve, while, at the same time, they are unattended with danger if carefully attended to.

X If a part be affected with acute erysipelas, arising after an operation, and the erysipelatous action spread and become diffuse, then the stitches should be taken out and the wound left open, so as to relieve the tension and favour the escape of the discharges. Where the erysipelas is idiopathic, the application of anodyne fomentations, such as some very weak acetate of lead and opium lotion, or even dusting with finely powdered starch (hair powder), will often be sufficient. When the local inflammation is tense and painful, and where there is a risk of its spreading, we must use more active measures. In some cases punctures in the part are indicated, and these, with warm fomentations afterwards, answer very well. In other cases incisions give more relief. The late Sir William Lawrence proposed to make one or two long incisions when the limb was very tense, instead of several smaller ones : he said it produced less irritation ; but this causes great deformity ; and, moreover, the surface of such a wound is apt to take on an unhealthy action ; so that it is better to make several incisions about two inches in length, than to make one incision six inches long. The incisions relieve tension not only by depletion, but by allowing the exudation and sloughs—if there be any—to escape. In erysipelas of the face, incisions should not be made, even though the tension be great, and even punctures are objectionable, on account of the deformity they would produce. When the disease attacks the scalp, however, it is often necessary to make incisions, to prevent the important deep structures from being affected.

In erysipelas of the face, the best local treatment consists in the application of some fine bland powder, which will allay the local irritability ; the part should then be covered with a layer of cotton wadding, to protect it from the air. This, with proper constitu-

tional treatment—the use of diaphoretics and purgatives—will generally cure the disease. But such cases must be watched very carefully, because there may be effusion of purulent matter in the eyelids, and then we must make incisions to relieve the patient. Sometimes the face may be painted over with oil, which soothes and cools the part ; but occasionally it seems to give rise to irritation. A change from the powder to the oil often does good, but as a rule, the powder gives more relief, and is besides more cleanly. When hot fomentations are used, care should be taken, on their removal, to cover the part with a layer of cotton wadding to protect it, otherwise the irritation will be increased.

In phlegmonous erysipelas free incisions are to be made in the part affected, because here not only is the skin affected, but after a time the fascia and intermuscular septa, as well as the subcutaneous and deep cellular tissue. Effusion, either serous or aplastic, takes place under the fascia, and between it and the skin, and hence the bogginess, tension, and apparent softening of the limb. The treatment requires to be very active, and the incisions must divide freely the fascial texture. In the arm we often make incisions along the radial and ulnar sides as well as in the front. When infiltrated suppuration occurs, a mere opening and counter-opening, as in ordinary abscesses, will not do, but several incisions must be made to give free vent to the acrid purulent matter. Much sloughing of the aponeurotic textures will often take place, especially when they are very dense, as for example the fascia lata of the thigh, or the fascia of the forearm, however active the treatment may have been, and hence the necessity for free incisions to allow the sloughs to escape or be removed, as they would otherwise keep up great irritation.

A remedy very frequently used in erysipelas is the local application of nitrate of silver ; but, so far as my experience goes, it is not generally attended with good results. If we apply it over a large surface, the remedy becomes worse than the disease. Sometimes it is applied round the limb, beyond the affected part, so as to arrest the progress of the disease, and

occasionally it does so ; but in the majority of cases the disease will spread beyond the line of the nitrate of silver. Blisters have been applied to the limb for the same purpose, and by them too we sometimes succeed in arresting the spread of the disease. The principle is correct in both cases—namely, to get rid of the diffuse inflammation which is characteristic of erysipelas, and substitute a more healthy form of inflammation with plastic exudation which may limit the local action. But we cannot be sure of exciting this more healthy action either by blistering or by nitrate of silver ; and the parts to which they are applied are not unlikely to assume an erysipelatous or even sloughy character.

Before leaving this subject, I would repeat the caution that during convalescence from an attack of erysipelas, great care should be taken. The circulation is always impaired during the progress of the disease, and continues so in many cases throughout a long period of convalescence. This state is sometimes attended with a risk of fatal syncope. The patient should therefore be kept at rest and very quiet for some time after the violence of the disease has passed away.

## LECTURE XVI.

Furunculus or Boil—Nature of the affection ; its progress—Pathology and Treatment—The Carbuncular Boil—Anthrax or Carbuncle : its appearance and the conditions which give rise to it—Local Treatment by free Crucial Incisions—Cautions—Constitutional Treatment.

THE term FURUNCULUS or BOIL is applied to a diseased condition affecting the true skin, and sometimes the cellular tissue underneath. It assumes the character of a firm circumscribed inflammatory tumour, of a deep red colour, and conical form. It is attended with acute throbbing pain, and a sensation of itching, burning heat, together with great irritation of the surrounding parts, and constitutional disturbance. At the base the swelling presents a considerable degree of hardness, and there the colour assumes a lake tinge. This colour gradually shades off towards the apex where some whitish or yellowish-looking matter may be seen shining through the wasted integument. The matter is only an imperfect kind of pus, and its evacuation gives little or no relief ; often, indeed, the reverse, on account of the irritation set up by the interference. It consists really of portions of broken-down cellular tissue mixed up with sloughy unhealthy pus.

Boils vary in size from that of a large pea to that of a walnut. They may appear singly or in groups ; but if singly they are apt to follow each other in very rapid succession. They may be situated in any part of the body, but they are said chiefly to affect the fore part of the body, more particularly the face, neck, and armpits. Doubtless they do often occur on these parts ; but it is by no means unusual to find them in localities the very opposite of these, as on the back, nates, and thighs.

The progress of formation may be either rapid or slow, according to the state of the constitution and the violence of the disease. The first form it assumes is that of a small pimple-like projection, and the pain is of a hot, itching, and irritable character. The patient, probably, irritates it further by scratching or squeezing, and, instead of going away, the swelling increases, the base becomes broader and harder, and the body prominent and conical. Thereafter it gradually becomes more congested, until at length it presents the character already described. At length the skin begins slowly to ulcerate, and that generally by a series of small openings. From these unhealthy pus is discharged, and ultimately the minute apertures in the skin merge into one. A small mass of dead cellular tissue—the core as it is called—is then discharged, and thereafter the pain ceases. Healthy action succeeds, and the part contracts and heals rapidly.

The disease is essentially a circumscribed unhealthy form of inflammation of the skin and subcutaneous cellular tissue, terminating in imperfect suppuration. This suppuration is induced by a mortification of the affected cellular substance, which proves a source of irritation. When this is discharged by ulceration of the apex, the disturbing cause is removed, the diseased action ceases, and the part heals. The states of the constitution which give rise to, or accompany it, are generally those associated with derangement of the digestive functions. This is the case in almost all diseases of the skin—over-feeding or starvation may give rise to it. Rich and stimulating diet, pastry or sweetmeats, over-indulgence in the use of wine, spirits, or malt liquors, or, in short, anything which tends to disorder the system. Exposure to cold and wet, sleeping on a damp bed, or extraordinary fatigue, may also induce the disease. It frequently occurs, also, during the convalescence of patients from febrile attacks, and is often associated with rheumatism.

The *Local Treatment* of FURUNCULUS is very simple, so much so, that in ordinary cases surgeons are seldom consulted. The boil should be first poulticed, and after a time opened by means of a crucial incision. A narrow bistoury should be run fairly



through the base in both directions, and then the core or slough squeezed out. Should the core prove slow of separation, however, touch it over freely with nitrate of silver. Thereafter apply poultices, and when the slough has separated use simple warm-water dressings or stimulating lotions as the case may require.

The *Constitutional Treatment* must be conducted on general principles, according to the circumstances of each particular case. If the patient be feverish, with hot skin, scanty urine, and constipation, small doses of colchicum, and saline purgatives, are useful, followed by small doses of rhubarb and potash to regulate the bowels. If the urine be very acid, alkalies should be exhibited, but if it be at all phosphatic, alkalies are to be avoided, and dilute nitric or nitro-muriatic acid given instead. In cases accompanied with anæmia, the use of chalybeate remedies will be found very beneficial ; and in cases of debility, the use of quinine and other bitter tonics may be had recourse to with advantage. But this department of the treatment really belongs more to the domain of the physician than the surgeon.

Sometimes we meet with cases in which, after the small boils fade away, one particular boil becomes very much enlarged and prominent, assuming a less acuminate form, and having a broader and more congested base, with greater surrounding hardness. This is termed the CARBUNCULAR BOIL. In this form the skin texture is more largely affected, and the subcutaneous cellular tissue becomes secondarily involved.

The *Local Treatment* of carbuncular boil is of greater importance than that of the simple form. We require to make very free crucial incisions through and beyond the base—not only in order to allow the matter at the top to escape, but also to provide for the separation of the slough, which would cause great irritation if left behind. This treatment will also tend to relieve tension and diminish pain. Poultices are then applied to allay irritation, and favour the separation of the slough. The constitutional treatment must, as in the case of ordinary boil, be regulated according to the condition of the patient's health.

ANTHRAX or CARBUNCLE is another form of inflammatory disease of the skin tissue, having some similarity to boil, but much more serious in its character, always attended by great constitutional disturbance, and not unfrequently terminating fatally. It is a most painful and exhausting disease, generally associated with a weak, irritable, and vitiated state of the system, and has its origin chiefly in predisposing constitutional causes.

The disease may be described as being a peculiar form of inflammation of the skin texture, to which it is at first wholly limited. Small points of unhealthy pus are deposited in the integument, and this process is attended with intense pain of a hot, burning character, owing to the denseness of the texture, and the consequent resistance which the fluid meets with in the process of deposition. The substance so thrown out can hardly be called pus; it consists rather of a sloughy material, formed from the *debris* of broken-down texture which has been destroyed by the violence of the inflammation.

The swelling is at first of a hard and brawny consistence, and a dusky red colour, but it soon becomes boggy in character, and the red darkens into a livid purple hue. In form it is more flattened and diffuse, and not acuminated as in the common boil. It is usually extensive, but varies in its dimensions from the size of half a small orange to that of an ordinary saucer, or even larger. For example, it may sometimes extend from the neck down to the shoulders and upper part of the back.

On close examination we find that the skin texture has become thickened and somewhat opened out by the exudation deposited in it, and by the increased vascularity, while its interior is found to be studded over with little white suppurating points. These at length ulcerate, and pour out a flaky semi-purulent fluid; afterwards they tend to enlarge, and at length coalesce and form an opening large enough for the escape of the slough. This separates very slowly, but when once completely thrown off the healing action sets in.

Although the disease lies originally in the skin, it may,

in consequence of the violence of the inflammation, spread by contiguity to the deeper-seated textures. Thus it generally involves the cellular tissue beneath the skin, and often extends to the fascia beyond. The fascia, if dense, presents very little vascularity ; it therefore speedily undergoes a sloughing, unhealthy action, and so the diseased condition spreads to the muscles underneath, and may thus involve greater depth of parts, in some cases laying bare even the bones if not interfered with.

We seldom meet with more than one carbuncle at a time, and it is generally situated on the back or on a part endowed with but little vitality. Sometimes, however, it occurs on the forehead or on the scalp ; and I have seen a very considerable one form on the epigastric region in a patient who had long suffered from dyspepsia.

The disease occurs for most part in people of debilitated constitutions, who have formerly lived freely. Mr. Hunter states that he never saw carbuncle in an hospital patient but once, and that was in a gentleman's butler. This broad statement, although true in the main, might tend to mislead, for we do find the disease occurring in patients in the lower ranks of life, more especially amongst such of them as are debilitated from previous habits of intemperance or from disease. Its chief victims, however, are those who take much animal food and wine without taking sufficient exercise. In these the digestive organs become deranged and unfitted to do their work. The kidneys also become affected, and the urea which they ought to eliminate is retained and circulates in the blood. One very frequent predisposing cause is to be found in the gouty habit ; and some of the worst cases I have seen have occurred in connection with Bright's disease, on account of the blood-poisoning which arises from the urea not being eliminated from the system. It is said to be a symptom or accompaniment of malignant fevers, as the plague, where usually several of these tumours appear simultaneously.

The constitutional symptoms which accompany this local affection are generally those of irritative fever tending to typhoid,

and consist of rigors, restlessness, and want of sleep, nausea, vomiting, and diarrhœa, alternating with profuse sweating. The tongue is pale, loaded, and flabby. The pulse is quick, weak, and irritable. The expression of the countenance is pinched and anxious. There is palpitation, and in bad cases giddiness, drowsiness, and tendency to coma, and sometimes low muttering delirium.

With regard to the pathology, carbuncle may be classed with those diseases which are characterised by excessive local action, with deficiency of vital power. The local affection is similar to that of furunculus, only differing in degree and extent of diseased action, rather than in essential nature. The diseased skin has a brawn-like appearance when seen in section. The process of suppuration is tedious and partial, the death of the cellular tissue is very extensive, and ulceration of the surface takes place slowly, and as we have already stated the diseased action involves the fascia and deeper seated parts, and in some cases lays bare the muscles and vertebrae.

The *Local Treatment* should consist in making free crucial incisions into and beyond the diseased part. By so doing we will not altogether prevent sloughing, because, from the very commencement of the disease, sloughs are almost sure to be present; but we prevent the disease from spreading in surface and in depth, and also permit a free escape to the slough which keeps up the irritation. The incisions must be carefully made; they must go completely through the inflamed textures, and beyond them into the healthy skin, otherwise the disease will extend from the circumference. Though smaller incisions may relieve the pain and tension for a time, they will not cure the disease. The whole texture having the little points of slough in it ought to be cut through. This looks cruel, but the amount of relief afforded by it is very great. No matter how weak the patient be, the incisions ought to be free.

Sometimes when the carbuncle is large a third perpendicular incision may be made with advantage. After the incisions are made, charcoal or yeast poultices are to be applied, and if the

slough be slow of separating, the application of nitric or sulphuric acid or potassa fusa to it is useful, so as to destroy it thoroughly and rapidly. These escharotics should only be applied on the dead textures, and not on the skin. The incisions are apt to bleed very smartly, but we need not be afraid of this, unless in certain localities, such as the scalp, and there the vessels must be tied. An ordinary carbuncle on the back or hips seldom goes deep enough to involve any large vessel. The bleeding in these cases comes from the highly inflamed and highly vascular integument.

In certain states of the constitution, however, as in cases where it is complicated with, or supervenes on albuminuria, we need to beware of continued slow hemorrhage. For in such cases the blood is apt to be deficient in fibrine, and wants the natural tendency to coagulate: hence the part may not bleed much when cut into, but afterwards the blood begins to ooze away gradually, and would soon exhaust the patient if not arrested. When this happens, the actual or potential cautery should be applied so as to check the oozing. This, however, will seldom be required if the patient be carefully watched.

Different opinions are held as to the constitutional treatment of carbuncle. Some hold that it is a disease of debility, whether induced by over-feeding or want of nourishment, and that, therefore, we should support the patient's strength by giving quinine, animal food, and stimulants from the first. Others, again, consider it to be a very violent form of inflammation, and hold that the treatment ought to be antiphlogistic, consisting of low diet, and the use of antimonials to allay the fever. Now, either of these plans, if carried out to the extreme, would be dangerous. The disease is one of irritability of constitution, mixed up with considerable debility, and it ought not, therefore, to be treated either with large quantities of stimulants or with remedies of a too depressing nature. The constitutional treatment should be conducted on the same principles as those inculcated in the treatment of the senile gangrene of Pott; for in both of these diseases there are irritable states of the constitution, and a tendency to weakness



from previous disease, with violent local action. Therefore the regimen should be of a nutritious but non-stimulating kind. The use of opiates is very beneficial, except in cases where the patient is labouring under Bright's disease. There opiates are contra-indicated, as, under such circumstances, their use is apt to be followed by a particular form of coma. Sometimes, in such cases, chlorodyne may be sparingly given. But under any circumstances, we must always watch carefully the effects of any opiate we may give. Along with the opium, small doses of antimony may be given at first, and in the latter stages tincture of muriate of iron should be substituted. The bowels should be kept regular, and the urine examined from time to time. The diet should be nutrient, but non-stimulating, such as farinaceous food, milk, and white of eggs; but if the patient has been used to very free living, this diet would be insufficient to sustain him long, and the exhaustion so produced would prevent the wound from healing. In such cases, therefore, when the local action is somewhat abated, a more stimulating diet is necessary, and some animal food may be given with advantage.

When the patient is very weak, and also during convalescence, stimulants may be allowed, and light wines, such as claret or hock, are the best—not burgundy, for it produces as much febrile action as port does. Port is not to be given unless the patient has been in the habit of taking much of it previously. Champagne, with a little brandy, is useful when the patient is very low, or where diffusible stimuli are needed; also brandy or other spirits, either alone or mixed, with tincture of cardamoms or other aromatic tincture. Alkalies are to be avoided as a rule, but they may be administered under special circumstances. Where there is heartburn or acidity of the stomach, with flatulence, give oxide of bismuth with aromatic powder. In some cases of flatulence, dilute nitric acid, in small doses, answers better than any other remedy. In all cases where there is great constitutional irritation, we must give opiates to procure rest, but their effects should be very carefully watched.



## LECTURE XVII.

Definition of Tumour-growth—Distinction between Tumours and Hypertrophies ; between Inflammatory Swelling and Tumour-growth—Classification of Tumours : their separation into the two great divisions of Simple and Malignant—Simple Tumours : their vital manifestations, structural peculiarities, diagnosis, and history—Malignant Tumours : their characters, etc.

FROM the study of inflammation, and those diseases which are more closely associated with it, we now pass on to the consideration of the subject of morbid nutrition, as it is exhibited in TUMOUR-GROWTH. In its ordinary acceptation, the word tumour means a preternatural swelling of any kind. In surgical pathology it has a special signification, and is understood to denote “An overgrowth resulting from morbid or abnormal nutrition, which, instead of merely supplying new material sufficient to repair waste of tissue, yields a redundancy, thereby leading to overgrowth, with more or less alteration of structure and form.” But this definition is not sufficiently exact. A true tumour has other characteristics besides those mentioned. The substance thrown out is not merely ordinary plastic material in excess, as in inflammatory swelling, where there seems to be merely a deposit of new matter into the texture ; but, in a true tumour, the material exuded by the capillaries of the part has in itself a peculiar innate power of attraction and selection whereby it can reproduce a texture peculiar to itself, but different from the natural tissue in which it grows ; while, in ordinary nutrition, the material is either assimilated to the textures to which it is supplied, or gradually removed by absorption. The increase in tumours is dependent on the surrounding tissues for little more than the vascular supply, which increases with the size of the tumour.

The definition given above seems to include some cases of hypertrophy, which consists of mere increase in development. And as many of these come practically to be spoken of and treated as tumours—both being expressive of a morbid formative force tending to increase—they are often included in the same class. There are, however, some well-marked points of difference ; and as these have practical bearings on the mode of treatment, and as the enumeration of them may serve to bring out more clearly the characteristics of true tumours, I shall endeavour to point out—*First*, the distinctions between hypertrophies and true tumours ; *Secondly*, the difference between inflammatory swellings and tumour-growths.

In simple hypertrophy, the enlarged organ maintains its natural type, form, and structure, however much it may increase in size—it is, as it were, merely magnified. Thus, in hypertrophy of the thyroid body, the gland becomes simply enlarged, but this enlargement differs from tumour-growth, inasmuch as the organ is not materially altered in structure, form, or function, but is simply magnified in size. Then, again, in enlargement of the prostate we have mere hypertrophy ; the lateral and middle lobes become enlarged and project beyond their natural boundaries, but no abnormal formation of texture exists in connection with it. Another example may be found in the pregnant uterus. The walls of that organ undergo during gestation an enormous hypertrophy, yet its type, form, and functions remain unchanged, only modified. Again, in hypertrophy of the heart, we find another instance of a similar kind.

Now, in tumour-growth there is an essential deviation from the normal form and type tending towards deformity, and this deviation goes on increasingly even in the simplest examples, where at first the structure of the tumour is analogous to that of the organ or part in which it has been developed. Thus, for example, in fibrous tumour of the uterus, there is at first a great similarity to the texture from which it grows, but gradually it assumes a distinct form and character of its own. Again, in the case of nasal polypus, the growth is

almost identical with the mucous membrane of the nose, from which it springs ; but as the tumour advances in size, there is a marked deviation in form and mode of growth. In a fatty tumour we find simple fat, but it assumes a form which fat in its normal state never presents. In lipoma of the nose there is hypertrophy of the skin at first, but this at length gives rise to deformity by outgrowth.

In addition to these points of contrast, it has been suggested that hypertrophies are usually adaptations of structure to meet some emergency of the system, as if nature had provided them for a special purpose ; and examples are given of hypertrophy of the heart in impeded circulation, of the uterus in pregnancy, and of the bladder in stricture. In each of these cases there exists a necessity for increased muscular force, in order to overcome manifest obstructions, whereas, in cases of tumour-growth, there is the absence of all adaptation or apparent necessity.

It is difficult, however, to prove the argument good in every case. In enlargement of the prostate, for example, we can trace no adaptation or purpose ; it seems to meet no emergency in the urinary system, but rather to interfere with its functions. In hypertrophy of the tongue, also, we find a condition which, instead of being a response to any physiological call from the economy, is, in fact, an actual impediment to the healthy action of the organ, and is hazardous even to life itself. Remember, therefore, that in hypertrophy we have simple enlargement of the organ by the additional growth of matter like that already existing, while in tumours the new material is essentially different in form and vital tendencies.

We shall now consider the points of contrast between inflammatory swelling and tumour-growth, which have been well pointed out by Mr. Paget.

*First.* The accumulation of lymph, which causes the swelling in inflammation, is, as we have seen, due to the excited action of the capillaries of the parts at or adjacent to the seat of exudation. There is no evidence that the swelling

increases by any inherent power or self-organising matter, but rather the contrary ; for we have seen that if inflammatory exudation be poured out rapidly, and in large amount, it may interrupt the nutrition and destroy the vitality of the part. On the other hand, tumour-growth is of itself; it has a vital and pathological individuality of character, so that while tumours may be regarded as parts of the body, yet they grow by an inherent force of attraction and assimilation, by multiplication of their own cells, and they depend upon the surrounding textures for little more than the blood from which they derive the materials appropriate for the purpose of organisation. A tumour increases constantly and with increasing rapidity. An inflammatory swelling increases only so long as the morbid condition of the surrounding parts continues.

*Second.* The material or exudation thrown out in each case has different capacities of development, for while in tumours the new material may alternately assume a variety of forms or structures, the inflammatory exudation possesses scarcely more than the single capacity to form white fibroid tissue.

But perhaps the most marked points of contrast between inflammatory swelling and tumour-growth are to be found in the conditions which are presented by each subsequently to the organisation of the materials or exudations which compose them. Organised inflammatory exudations, like those provided for the repair of injuries, are usually of a kind which constantly approximate to the healthy condition and form, if not to the exact tissue of the parts amongst which they are situated, or they gradually waste away, and all superabundant matter is thus got rid of. With tumours the case is just the reverse. In them the new material continues to increase and develop by inherent and peculiar self-organising power, diverging further and further from the natural form and structure. Although resembling natural tissues, yet they differ in their laws of development ; they are not dependent on, nor do they grow in proportion to the rest of the body, but often seem to develop themselves at the expense of the system, for they continue to in-

crease, while at the same time the surrounding textures and the body generally may be wasting away.

Tumours, therefore, must be regarded as overgrowths possessed of inherent self-organising powers, irrespective, in a great measure, of the maintenance of the rest of the body, and developed without any apparent function or purpose.

Having thus briefly indicated the conditions which distinguish inflammatory swellings and simple hypertrophies from true tumour-growths, we shall next proceed to consider the CLASSIFICATION OF TUMOURS. Some difference of opinion exists in the present day regarding the grounds on which our classification and nomenclature are to be based. Some pathologists propose that our distinctions should be founded on the appearance and structure presented by different growths as examined with the naked eye and by means of the microscope ; but, whilst by no means undervaluing such structural appearances, it seems to me that mere structure, apart from the vital characteristics of such growths, is by no means sufficient to enable us to distinguish their true nature ; and as the structure cannot be fairly examined until after the removal of the growth, I think a more practical classification and nomenclature is that which recognises the characters of the growth, and indicates them by terms expressive of quality, nature, and tendency, rather than by such as denote structure alone. I will therefore adhere to the old terms—*Simple* and *Malignant*—as expressive of the two great classes into which all tumours may be divided. They are sometimes classified as Solid and Cystic, or hollow ; but some tumours are at one period of their growth quite solid, and at a later stage of progress they contain cysts in their interior. This should therefore be regarded as merely a subdivision, and not a classification.

The vital manifestations of SIMPLE TUMOURS are, slowness of growth, the absence of any affection of the general health constituting cachexy ; little local pain or uneasiness, except such as is produced by their bulk or pressure, interfering with the functions of important organs. They have no inherent tendency to



ulcerate, although this may sometimes arise from causes of irritation foreign to themselves—such as the application of pressure, caustics, or discutients. They are usually well defined by a delicate cyst of condensed cellular texture; they have no tendency to involve neighbouring tissues in the same morbid action; and if once properly removed they never return again. In structure they are regular, and resemble in many cases some of the natural textures of the body. Thus we have fatty tumours, or tumours composed of fibrous tissue, or tumours closely resembling in structure the different glands.

Simple growths are readily separable, and freely movable, so that after a careful examination they may easily be diagnosed. These characters will often enable us to distinguish simple from malignant tumours during an operation for their removal. It is most important to find out, say in a mammary tumour, whether it is completely movable, or whether at one point it is fixed or less defined. If there be complete definition, and if the other characteristics of a simple tumour be present, then the growth alone should be removed. But if the tumour be attached at one point, even though very movable at all others, then, if the patient be above middle life, the surgeon should rather remove the whole breast than run the risk of recurrence by excision of the tumour only. Again, in considering the propriety of removing certain growths near important organs, if the tumour be simple we may proceed to remove it with almost a certainty of success, because such a tumour has natural definitions which prevent it from including vessels or other important parts. For, as a rule, a simple growth, whilst it may adhere to, compress, or displace structures, has no tendency to destroy texture or invade organs contained in a common fibro-cellular sheath. In malignant growths it is different, because in them the tumour often involves parts which it would be fatal to divide. Another essential difference between simple and malignant tumours is, that the former have no tendency to return after removal, either in the same part or elsewhere.

The simple tumour has no tendency to ulcerate unless irri-



TUMOURS.



Fig 2



Fig 1



tated. Ulceration may take place in a fibrous tumour, which grows very rapidly towards the later stages on account of its increased vascular supply, and where pressure of the mass leads to ulceration of the skin. The part which does ulcerate possesses very little vitality in itself—it bleeds by opening into the vessels supplying the tumour, and there is all the appearance of fungus hæmatodes. From the loss of blood the patient becomes exhausted, and looks yellow and anæmic, with quick pulse. The symptoms here might be mistaken for those of a malignant tumour, but the previous history of the growth will decide its true character. Cases do occur, however, in which simple tumours may, either from irritation or improper interference, degenerate locally, become adherent to neighbouring parts, and even assume some of the vital characteristics of malignant growths, but this degeneration I believe to be merely local. And when such a tumour is removed by operation the constitutional symptoms disappear, and there remains no tendency to recurrence of the growth, either in its former site or in any other part of the body.

MALIGNANT GROWTHS are very different in character, both as regards structure and vital manifestation. Generally speaking, they grow rapidly, and are accompanied by marked constitutional symptoms of a cachectic character. They are painful, and apt to degenerate, having a peculiar tendency to softening and ulceration even in the earlier stages. In structure they are irregular, and in form undefined. On manipulation they feel soft and elastic, with here and there hard resistant portions; although in some parts of such a tumour the elasticity may amount to a feeling of fluctuation, or actual fluctuation may be present, yet in no case is it equal throughout. In this they present a contrast to the simple fatty tumour and the chronic abscess, the former of which presents a feeling of elasticity, and the latter of fluctuation, but in each the feeling is uniform in every part. Their tendencies are very aggressive, involving the neighbouring textures directly, or, through the medium of the lymphatics, affecting the neighbouring glands.

Thus the whole system becomes involved in the mischief, and an operation, if performed, is followed at best only by temporary benefit, and, sooner or later, there is recurrence of the disease either in the same locality or some other part.

But in addition to these—malignant growths have some special characteristics which more particularly demand our attention.

1st. The structure of malignant growths, whether viewed by the naked eye or by the aid of the microscope, presents appearances very different from what are to be found in simple tumours. They are of a very unequal consistence, varying from a gelatinous or cerebriform pulpiness to fibroid or fibro-cartilaginous hardness ; and all these different conditions may be found in the same growth. Their intimate structure is composed of cells resembling those of glands or epithelium, but larger, and studded with numerous nuclei, showing great power of rapid development. Their structure is not uniform, but consists of dissimilar cells heaped together irregularly. In certain forms of malignant growth, however, the arrangement is more regular, and in these the size of the cells, together with their numerous nuclei, form the distinctive structural character.

Malignant growths may at first assume a definite outline and form, or they may appear as infiltrations into the proper structure of organs, as in acute cancer of the mamma ; but this seems to be modified by the structure of the organ affected. Thus, scirrhus or hard cancer of bone, at first appears defined in form, so also do the cancerous deposits in the liver. Soft cancer, when it affects the uterus, generally appears as an infiltration. In the breast at first it frequently assumes the appearance of a defined tumour ; in reality, however, there is no true definition, the surrounding structures yield to the influence, and not only become affected by, but propagate, the diseased action. Whilst malignant growths may be anatomically limited or defined by the structure of the organ in which they occur, yet they are not physiologically so limited. Thus, a malignant tumour, commencing in the interior of the shaft of a bone, is bounded laterally by the dense osseous wall of the bone and periosteum, and at either end

by the cartilage of incrustation, but it can never be absolutely limited in the living body, as the blood supplying it circulates ; and hence even in such cases the muscles near the tumour very generally show altered structure by the presence of proliferous cells.

2d. The tendency to ulceration from softening and rapid destruction of superimposed parts which have been involved in the disease. This is to be distinguished from the ulceration occasionally occurring in large simple growths, where the textures have ulcerated from mere mechanical pressure, or in consequence of local irritation. In malignant ulcerations, the fungating open surface is a part of the disease, and the margins of the sore—supposing, as sometimes happens, that the original growth were to slough out—would not heal, but would continue to propagate the diseased action. “The margins of a cancerous ulcer are themselves cancerous.” In simple ulceration, on the other hand, the exudation merely impairs vitality or impedes contraction ; and when a simple tumour which has ulcerated is removed or sloughs out, the margins regain their healthy condition, contract, and take on a kindly healing action.

3d. The tendency of malignant growths is to propagate similar formations, either by involving other textures directly, or through the media of the lymphatics, by which the neighbouring glands and their related structures are implicated in the diseased action. And finally, they are characterised by their great tendency to return after removal, either in the part from which they were removed, or in some other region of the body.

## LECTURE XVIII.

Special Simple Tumours—Simple Vascular Sarcoma : its nature and treatment—

The Adipose or Fatty Tumour : its general characteristics and occasional peculiarities—Adenoid or Glandlike Tumours : their points of resemblance, structure, and history—Fibrous Tumours.

IN yesterday's lecture, after briefly defining the word tumour, and explaining the difference between tumour-growth and hypertrophy, I endeavoured to point out to you the distinctive characters of simple and malignant tumours. These I wish you to bear in mind as we proceed further to discuss individually the varieties embraced in each subdivision. The first subdivision includes the special simple tumours, and of these we shall first consider SIMPLE VASCULAR SARCOMA. This term indicates a tumour of a somewhat fleshy consistence resembling that of the natural tissues, the development of which appears to depend upon the persistent increase of its vascular supply. It is the simplest of all forms of tumour-growth, and very closely resembles hypertrophy, only it is an outgrowth different in character and form from the part in which it grows, though resembling it in texture. The ordinary polypus is an example ; in structure it very closely resembles the mucous membrane from which it grows, but in form and character it entirely differs from that membrane, inasmuch as it has a narrow pedicle, and projects widely. These polypi seem to be recurrent, but it is not a recurrence of the tumour, because several grow together, and though the larger ones be removed some small ones are left behind, which develop themselves and require removal. The ordinary nasal polypus is one of the simplest forms of tumour.

Another form of simple sarcoma consists merely in increased development of the skin, and is found chiefly affecting the nose ; it



also arises from an increased vascular supply of the part. So long as the part remains of the normal form and type it is considered to be hypertrophy of the skin, but when a tumour diverging from the natural form of the part is produced, giving rise to great projection as in this case, then it is called a vascular sarcoma. The tongue sometimes, from an increased vascular supply, becomes very much enlarged, but this is only hypertrophy, as the swelling keeps to the normal type and form of the organ, and is not discordant from the natural textures. There are other kinds of simple sarcomatous tumours, but their characters are much the same as those mentioned. They all grow from an increased vascular supply, and at first their growth is very slow. It is this form of growth, and especially the hypertrophies included in it, that we can do most to get rid of by medical treatment and local applications without the necessity of operation, especially in the earlier stages of the growth. The application of blisters or iodine to the tumour, and the use of the iodide of potassium internally, often cause simple tumours of the thyroid body to disappear very rapidly, though certain forms, such as the vascular pulsating tumour of the thyroid gland, do not disappear so readily, but these possess some of the characters of an erectile tumour. In hypertrophy of the tongue also we may often avoid the necessity for operation by the use of deobstruent remedies, as iodine, or by applying pressure on the tongue, along with deobstruents internally—avoiding all preparations of mercury. Occasionally, however, operation, by incisions or excision of a V-shaped portion of the organ, must be resorted to. It does not follow that because such medical and local remedies may prevent the necessity of operating, it is the safest or best method of treatment. For example, in polypus of the nose no one would continue a long course of deobstruent remedies when a single twist of the forceps removes the disease effectually with little pain and no danger. So also, in lipoma of the nose, the disease might be got rid of, perhaps, by strict diet and regimen, or local deobstruent applications, but it can be much sooner removed, and with less harm to the constitution, by operation. Generally,

when removal by operation can be readily and safely performed, it is better to have recourse to it than to use a long and debilitating course of medicines.

The ADIPOSE or FATTY TUMOUR is another very simple form of tumour, and in structure is hardly distinguishable from a mass of fat, though it may sometimes be a little firmer. It consists simply of adipose tissue, in the neighbourhood of which it is generally developed; but it grows apart from it, and separated at first by a layer of condensed cellular tissue. Felt from the surface it may appear perfectly equal; if it be in loose tissue it often hangs pendulous. All fatty tumours are more or less lobulated, even though they seem to be smooth and rounded. Sometimes they are quite flat, and these, under the skin, often give a feeling of fluctuation or elasticity, and may therefore be mistaken for a chronic abscess. A fatty tumour can hardly be mistaken for a malignant growth, because there is no cachexia present nor quick pulse, and besides it is of very much slower growth. The latter character will also help to distinguish between it and an abscess. This kind of tumour generally lies quite loose, but occasionally it may insert some of its lobules below muscles, and so be closely related to large vessels, or the tumour may adhere to the under surface of the skin, and the layer of condensed cellular tissue be obliterated. In such cases the removal of the tumour becomes much more difficult than when it is loose. We must therefore take care not to use improper means of getting rid of such a tumour, as they may cause adhesions, and so render a simple operation tedious, or even dangerous. The fatty tumour sometimes undergoes degeneration, which is, however, of a purely local kind, and, in such cases, it may be mistaken for a malignant growth. Sometimes an abscess forms in a fatty tumour, giving rise to malignant symptoms, with great pain and a bloody discharge; but if the original history be that of a simple fatty tumour we may proceed to operate without hesitation, for its deep connections will be loose and easily separated. The simplest and safest method of treating the fatty tumour is ex-

cision, and that as early as possible, before complications arise, and before its bulk renders its removal formidable.

The FIBROUS TUMOUR is composed of fibrous texture arranged in regular masses, and sometimes lobulated. Between the different layers of fibre there are generally interstices containing fluid. When a section of the tumour is made, the appearance presented is very like that of the fibrous textures of the body. It is separated from the surrounding structures by a layer of condensed cellular tissue, and has often a sort of cyst or covering of its own.

• ADENOID TUMOURS, *Pancreatic sarcoma* of Abernethy, are usually included under fibrous tumours. They have nearly all the characteristics of fibrous tumours, but are different in structure. They were originally called pancreatic, from their great similarity in appearance to the pancreas. Their general history is the same as that of the fibrous tumour—slowness of growth, greater consistency than the vascular sarcoma or fatty tumour, and greater tendency to undergo local degeneration or breaking-down, or to become ossified or calcified, though the latter change takes place much oftener in the true fibrous than in the pancreatic tumour. Under the term pancreatic sarcoma used to be included many tumours which were not very like the pancreas, though possessing a gland-like structure, and therefore the term adenoid or gland-like tumour is now used, as being more correct, to include them all. The Adenoid Tumour is frequently developed in the neighbourhood of glands, such as the parotid, compressing that structure, or displacing it, so as to resemble a tumour of the parotid itself.

Fibrous and adenoid tumours are perfectly simple; they have no tendency to become malignant, though they may degenerate locally so as to ulcerate and fungate, and give rise to symptoms of malignancy, they do not become truly malignant so as to affect the constitution and forbid their removal by operation. They are very firm in consistence, and are well defined. When they come in contact with important parts, such as large vessels or nerves, they may lie upon, partially surround or push

them aside, or even become adherent to them, but they never really involve other structures, so that they can be safely removed by careful dissection, which we could not calculate on effecting were the tumour malignant.

The tendency to ossification or calcification is most marked in the true fibrous tumours, especially those of the uterus. This ossification is due to a deposition of earthy matter, carbonate or phosphate of lime, into the tumour, which gradually becomes smaller, the organic matter diminishing as the proportion of earthy matter increases. It is a slow process, and generally occurs in tumours in the structure organs. This tendency to deposit of earthy matter in fibrous tumours may, however, occasionally take place rapidly, and accompanied by symptoms which embarrass our diagnosis. In the case from which I removed this tumour from the forearm, the history was very much that of a malignant growth. It had attained its present size in less than three months, was very hard, irregular in form, adherent to the skin, which was beginning to ulcerate, and adherent also to the deeper structures, and the patient suffered from severe darting pains along the forearm. Yet you see it is merely a calcified tumour, which by its pressure irritated the neighbouring parts, and so gave rise to these symptoms.

Although the general history of the adenoid is very much the same as that of the fibrous tumour; its growth is sometimes more rapid, especially in the later stages, owing to its increased vascularity.

A tumour like the fibrous or adenoid, of dense structure, may lead to ulceration from its pressure on the superimposed parts, and so give rise to symptoms of malignancy. The diagnosis between a small, deep-seated, fibrous tumour, and a scirrhus tumour of the breast, is sometimes difficult. The chief points to be noticed are the regular and defined form, the greater mobility of the fibrous tumour, and the absence of any retraction of the nipple, together with the age of the patient and the history of the case. When the patient is above thirty-eight—before which time scirrhus seldom appears—if the diagnosis be doubtful, and we find the tumour undefined and ad-

herent, it is better to remove the whole breast than risk recurrence from leaving any portion of the tumour, as the loss of the gland is not so important at that age. If a fibrous tumour be very large, with darting pains through it, and ulcerating or fungating, with sanious discharge, the symptoms may be very similar to those of a malignant growth. These conditions, however, in a tumour originally simple, do not contra-indicate an operation. We must here trust to the history of the case and the state of the constitution, whether there is any real constitutional cachexia, or only exhaustion from irritation and discharge.

As regards the *Treatment* of all fibrous and adenoid tumours, even in the earlier stages, the best plan is excision, and the sooner it is performed the better, as there is less likelihood of other parts being interfered with by the tumour; and there is also less chance of any subsequent complication in the progress of the case. As I have already said, a fibrous or adenoid tumour may be removed with perfect safety, even though lying near important parts, because though it may displace these parts, and so require careful dissection, yet the other textures are never involved in the diseased action. In this case of fibrous tumour, which I now show you, the great sciatic nerve was completely embedded in the growth, but not affected in any way, so that it was readily dissected from the deep groove you see in it. Again, in this enormous tumour, which lay under the sterno-mastoid, and occupied also the deep parotid and facial regions in close contact with the great vessels, nerves, and important structures of the neck, I was able, by careful dissection, to remove the growth entire: it did not implicate these structures.\* In this other cervical tumour, also from beneath the mastoid muscle, owing to the original development of the tumour, it had separated the internal jugular vein from the vagus nerve and the carotid artery, the vein being partially obliterated by long compression; but the carotid and vagus, though lying closely related to it, were not involved, so that this tumour also was safely removed.†

\* See *Dublin Quarterly Journal of Medical Science* for November 1863.

† See *Edinburgh Medical Journal*, October 1867.



## LECTURE XIX.

Cystic Sarcoma—Encysted Tumours or Wens—Erectile Tumours or Nævi.

ANOTHER form of tumour which may be considered as a modification of the fibrous tumour is the CYSTIC SARCOMA. In fibrous and adenoid tumours we have seen that in the fibrous structure of the tumour there are interstices containing fluid. In many cases these form regular cysts, and sometimes the cystic portion of the tumour develops itself at the expense of the solid part, which then becomes compressed, and forms as it were septa between the cysts. In this way the multilocular or cystic sarcoma, of which this tumour of the testicle is a very perfect specimen, seems to be produced. In the interior of these cells or cysts we find a thin glairy fluid. They used to be called hydatid tumours, but are not so in reality. In the ordinary fibrous tumour we may have a large cyst occupying the centre. This happens from absorption of the septa and a number of small cysts uniting to form one large one. If this goes on, a condensed layer, formed by the fibrous stroma of the tumour, will be produced outside, forming a sort of sac. In this fibro-cartilaginous tumour the same cystic conditions may be seen. In some of the hypertrophies cystic formations may take place as in the thyroid body, where there is at first simple enlargement; then part of it forms into a cyst, producing a fluid swelling of part, and giving rise to what is called hydrocele of the thyroid or cystic bronchocele. The fibro-cystic tumour, then, may be regarded as merely a modification of the fibrous tumour, becoming cystic at different points, and sometimes even resulting in a single cyst.

The *Treatment* is the same—namely, complete removal of the tumour. In certain positions where we cannot do this, or when there is a moderate-sized tumour containing fluid, as in hydrocele in the neck, it is possible to destroy the tumour by drawing off the fluid, and then injecting iodine into it; but this method



of treatment is much less certain. It may be followed by partial ulceration and fungation, and if the tumour were near important parts this might prove very dangerous. In some cystic tumours of the breast, however, and in cystic tumours of the thyroid body, in which we cannot remove the tumour, we may lay open or tap it, and inject iodine. We sometimes make counter-openings so as to favour the escape of the fluid, and prevent deep-seated inflammation. In such exceptional cases this is the best plan of treatment ; but as a general rule the cystic tumour should be removed as soon as possible. In any form of tumour we may occasionally get rid of the growth by other means than excision, such as injecting the solution of chloride of zinc, or some other caustic solution, into the interior of the tumour, so as to cause it to slough out ; but this is attended with considerably more pain and risk, and is by no means so certain as removal by the knife, which is, therefore, the best treatment in all simple fibrous or fibro-cystic tumours.

Another form of simple tumour is the ENCYSTED TUMOUR or WEN. The tumour consists of a sac filled with fluid, and it occurs just beneath the skin. Wens vary in size from that of a small seed to that of an orange, and though met with in other parts, are chiefly found on the scalp and face.

The character of the encysted tumour or wen is different from that of the cystic sarcoma, in which the fibrous or adenoid tumour becomes converted into a tumour more or less cystic. In the wen the follicular apparatus is apparently deranged, and an altered secretion takes place. These tumours have received different names according to their contents, which are sometimes semifluid like honey, and are then called "meliceritous," or greasy, when they are called "steatomatous," or they are of a curdy consistence, and are then called "atheromatous." But the contents are the least important part of the tumour ; they have nothing to do with the tumour-growth. The cyst in this case is in reality the tumour, and the contents merely a secretion from it, so that if we remove the cyst and leave parts of the contents in the wound, they could not create a similar tumour, being simply a secretion without any vital power. The origin of the tumour

seems to be some disease in the follicular apparatus of the skin leading to obstruction of its ducts, and an altered action resulting from that. There are generally several cysts present in the same patient, and not a single one; when there is only a single wen we ought to be very careful, because these single growths are often a form of medullary sarcoma, and very different from the true simple wens or encysted tumours.

The complete removal or destruction of the cyst is the principle of *treatment* of wens. This tumour is originally quite loosely connected, and so, in general, is easily dissected or pulled out; but in some cases, such as an encysted tumour of the lip or eyelid, where the cyst is very delicate and tears easily, we cannot generally dissect or tear it out entire. Therefore, as we cannot be sure of removing the whole cyst, we cut out an oval portion of the tumour, evacuate its contents, and then destroy the remainder of the cyst with a finely-pointed piece of caustic. Briefly, the treatment of the wen consists in complete removal of the cyst, either by excision or by destroying it with caustic, after evacuating its contents.

ERECTILE TUMOURS or NÆVI.—These exist of various forms and sizes, from a small spot giving indication of a peculiar arrangement of the vessels of the part to a very large growth in muscles or in the cavities of bones. Some have made a distinction between the erectile tumour and the nævus met with in children; the former, say they, occurs in after-life from a tumour-growth really taking place, while the other is congenital. But it is very difficult to prove this distinction, because some erectile tumours in the adult may have been in existence as congenital conditions, and besides, the most minute examination will not show any difference as regards their characters. Occasionally, tumours have been called erectile which have had a truly malignant character. The erectile tumour is not so much a true tumour-growth as a peculiar arrangement of the capillaries and smaller arterial or venous branches of a part. When we cut into such a tumour it bleeds profusely, and when removed from the body, its structure is exactly like that of the corpus spongiosum urethræ. A section of such a tumour, after it has been injected, has been compared

to a portion of fine sponge which has imbibed a large quantity of red wax, and which has been cut open after cooling. In the great majority of cases of erectile tumour, and especially in the earlier stages, there is no tendency to enlargement of the great vessels in the neighbourhood, nor do the vessels entering the tumour present any very great enlargement outside the tumour, though they become dilated and tortuous immediately after they enter it. There is a form of aneurism by anastomosis, where we find a large number of dilated and tortuous vessels, behind the ear and on the scalp, but this is different from the erectile tumour.

The nævus is sometimes merely a discoloured mark, and not a prominent tumour, or it may project as a distinct erectile tumour. Formerly this form of disease was considered to be malignant; Mr. John Bell stated that the tumour, if interfered with at all, should be cut *out* and not cut *into*, and that there would be little or no bleeding, and no tendency to return if we cut wide of the growth. He was the first who drew attention to the fact that the neighbouring vessels were not at all enlarged, but he was wrong in supposing the disease to be malignant.

As regards the *Treatment* of erectile tumours, the general principle is to cause obliteration of the vascular texture by inducing inflammation and coagulation; and this may be effected in various ways. Cure, more or less complete, may arise from the part becoming inflamed from accidental causes, as in this remarkable case of arterial nævus of one side of the face, in which gumboil resulting from a carious tooth led to inflammation and abscess of the cheek, and to obliteration of the greater portion of the nævus. There was not the slightest tendency to hæmorrhage when I opened the abscess, and the part which had been affected by inflammation gradually assumed the natural colour and appearance. I wished to excite inflammation in the rest of the nævus, but the patient declined, so the nose and upper part of the face remain vascular and discoloured. We may strangulate erectile tumours by passing needles with strong threads through the base of the growth and tying them very tightly; the part which projects sloughs off, and the part still left is affected by the inflammatory action set up, and this action is sufficient to obliterate it. This

plan is the best when the *nævus* is very prominent. In other cases, the *nævus* may be destroyed by introducing a fine sharp-pointed syringe, and with it tearing up the vascular structure, and then injecting a little of the perchloride of iron, which will cause coagulation, followed by inflammation and obliteration of the vascular texture. The principle of treatment is to cause inflammation with effusion of lymph into the vascular texture, and consequent obliteration of the vessels. It is right to mention here that cases are recorded in which fatal results have followed on treatment by injection. I have not seen any such cases, but can imagine the possibility of the point of the syringe penetrating a vein, and the injection forcing a coagulum into the circulation, and so leading to fatal results. The rule for avoiding such a result is that which I have just indicated—namely, to break up the vascular structure with the point of the syringe first, and then to inject the perchloride solution.

Another remedy is the use of galvano-puncture to cause coagulation of the blood and excited action, first breaking up the tumour with the needles to allow the action to pervade the whole growth. It has also been proposed to tie the large vessels passing to the tumour. The common carotid artery has been tied in erectile tumours in the orbit, and the operation has been occasionally successful. Here the tumour, and the vessels supplying it, are limited by osseous boundaries and canals, and the obstruction of its vascular supply to a considerable extent may prove successful. But in erectile tumours of the soft parts, such as this erectile tumour of the long flexor of the great toe, in which I tied both the posterior tibial and peroneal arteries without effect, ligature of the vessels is not so certain. Where the tumour is suitable, the best plan is to strangulate it. The perchloride of iron injected, or threads dipped in it passed through the tumour are very useful, and so is galvano-puncture. Ligature of the great vessels, though sometimes successful, cannot be depended on.

The venous *nævus* is larger and more flattened generally, and wants the pulsating feel, but is in all other respects the same as the arterial *nævus*, and the treatment is the same.

## LECTURE XX.

Malignant Tumours—Brief outline of the varieties of Carcinoma, namely, Scirrhus, Colloid Cancer, and Epithelial Cancer—Characters, Causes, and Symptoms of Carcinoma ; its Diagnosis, Prognosis, and Treatment.

CANCER is a generic term including all forms of malignant growth, whether hard or soft ; and is usually characterised by the presence of peculiar proliferous cells, indicating great tendency to rapid growth.

The different forms of CARCINOMA are *Scirrhus*, *colloid* cancer, and *epithelial* cancer. The most frequent form is scirrhus or true hard cancer. This growth presents a peculiar appearance—a dense white structure, almost like that of a fibrous tumour, but very different in true character. It apparently contracts the textures and consolidates them, gradually bringing the different parts into closer contact. The white fibrous texture is sometimes arranged in masses, and projections pass off from the central mass to the different parts of the organ. This is well seen in scirrhus of the breast. The feeling on cutting through scirrhus is much the same as that experienced in cutting up cartilage partially ossified—the knife passes through it with a crisp grating sound.

Another form of carcinoma has the white striated fibrous bands arranged in a peculiar way ; they pass towards the surface, and form as it were septa, with interstices between them. These are filled with a sort of gelatinous matter, like melted glue or jelly, of a pale-yellow or dark-brown colour ; the septa themselves being cancerous matter, and the fluid part also containing the proliferous cancer-cells. This is the colloid or glue-like form of cancer.

A third form of carcinoma, the epithelial cancer, is found affecting certain textures, such as the skin and mucous membrane, and presents a sort of villous appearance. On examina-



tion, the cells are found to possess a form different from the ordinary cancer-cells, but closely resembling those of epithelium; though larger and containing more nuclei, being more proliferous. From its resemblance to epithelial structure, this form of growth was at first supposed to be innocent, and not really cancerous. It frequently occurs in the lower lip.

In certain cases the hard cancer assumes a somewhat different form, when it occurs as an infiltration poured out rapidly into the tissue of an organ, distending it and giving it a very swollen appearance. These are all forms of carcinoma possessing different structure and different appearance, but the vital manifestations of the tumour are the same in all cases.

The hard cancer differs from the simple tumours essentially in possessing all the characters of malignancy. It is of slow growth compared with some other forms of malignant disease; but is always rapid compared with the simple growths. It has not so much tendency to involve the parts in the immediate neighbourhood as the soft cancer or medullary sarcoma has, but it affects the lymphatics at an earlier period. It gradually, however, breaks through the limits of the organ in which it is developed, and then involves the neighbouring textures in a similar disease, and proceeds very rapidly. The general health of the patient is always affected sooner or later, and generally from the beginning. The patient has an exhausted and anæmic appearance—the cheeks are sunken, and there is a yellowish colour of the skin, with a quick pulse, and this even in the early stage. It used to be a question whether the constitution was affected in the first instance, giving rise to the cancerous deposits; or whether it was affected secondarily as a result of the cancerous growth. Now, however, there can be little doubt that we must look upon true carcinoma as a constitutional disease, though it may be excited by local causes; and in the latter case, the prognosis for relief will be more favourable. Still, in such cases the condition would not have occurred unless there had been the predisposing cause in the constitution. The disease is very often hereditary, though it may not affect every



generation. We must not trust too much to the history we get from the patient, because those affected with cancer often try to keep it as secret as possible ; and so other members of the same family may have been affected without the patient knowing it. Where the cancer arises from local causes—and certain forms of epithelial cancer very often do so—such as the chimney-sweepers' cancer,—which is of local origin, but is truly epithelial cancer,—in these cases there is little tendency to the return of the disease after removal. In the lip, also, there occurs a canceroid form of epithelioma, arising from some local irritation, such as that from a decayed tooth, or from smoking strong tobacco in a short pipe. In such cases there is little tendency to a return of the disease ; whilst other forms of epithelioma, not arising from local irritation, though removed wide of the disease, return either in the same part or elsewhere. In true epithelial cancer the disease is not more localised than in the other forms of cancer.

The symptoms of carcinoma are a peculiar hardness, pain of a sharp darting character shooting through and from the centre of the part. This sometimes occurs in irregular paroxysms, while at other times the pain is hot, burning, and almost constant ; the latter more especially in epithelial cancer. In old people the pain is generally not so severe. The peculiar hardness of scirrhus is important in diagnosing between it and other tumours, except, perhaps, fibrous tumours, which are sometimes rather difficult to distinguish from hard cancer. We must therefore look to other symptoms than the mere hardness. The want of complete definition will help you to diagnose between fibrous and carcinomatous tumours. If there be any want of definition, we should remove the whole organ in which it is situated, as for example, the breast rather than the tumour alone.

Hard cancer attacks the mamma very frequently, also the testicle—though not so often as the soft cancer—and very often the uterus. Also glandular structures generally, and parts of the mucous membrane—the mouth and lips, the rectum, anus, and the pyloric orifice of the stomach. The lungs and liver are not

unfrequently affected by it. In the liver it assumes a peculiar tubercular appearance. The hard cancer is somewhat slower in growth than other malignant tumours ; it may go on for three or four years without being noticed. It seldom commences before middle life—very rarely before 35, generally later ; from 38 to 40 is a very common age, though I have known cases occur much earlier, but these are exceptions : it thus differs from soft cancer in this respect.

When the carcinoma ulcerates, the ulceration proceeds very rapidly ; the edges of the cancerous ulcer involve the neighbouring parts and destroy them. A fungus is thrown out, bleeding takes place, and the patient sinks from the irritation and exhaustion caused by the ulceration.

The best *Treatment* of the hard cancer is early removal by excision. When it attacks the breast, the sooner we remove the entire organ the better, before the lymphatics have become affected. This may not ensure absolute immunity from return of the cancer, as it is a constitutional disease, but it gives the only chance of that, and will afford the patient relief for many years. Cancer often recurs in from four to eight years, but I know of one well-marked case of scirrhus of the breast which I removed twenty years ago, in which the disease has never returned. Excision is the least painful remedy, and causes least disturbance of the general health, and, if done early, gives the patient the best chance. But if the glands have become affected, and the disease be more widely spread, some say we should not interfere at all ; but this is too exclusive. If the glands be much affected, and if the skin be tubercular, then on no account should we operate, as there would be no definition ; but if the lymphatics be not much affected, and the skin not tubercular or brawny, then the only chance is to operate, though the case is not so favourable as one in which the glands have not become affected. It is said we should not operate, but desist from all treatment ; but the patient, getting no relief, is led to try any remedy, and this often hastens the fatal termination. Excision, even as a palliative, is, I believe, the best

treatment, removing the affected glands as well as the tumour. There are, however, certain cases in which we ought not to operate, as when the lymphatics are very much affected, or where there is an undefined tail-like projection creeping up from the breast towards the axilla. In cases of cancer where the skin is affected—red and brawn-like or tubercular—we can have no true definition even of the local disease ; I consider that in such cases operation is unwarrantable. In any case of cancer when the pulse is persistently high, above 100, the prognosis is unfavourable, as a low form of erysipelas is almost sure to supervene after the operation.

A new treatment has lately been proposed in cases of cancer—namely, the sub-cutaneous injection of weak acetic acid into the tumour. The principle of this is so far correct, and was suggested long ago by Professor Bennett, who showed that the cells of cancerous matter disappeared under the use of certain re-agents—among them being acetic acid—and were formed into a sort of amorphous matter. In cases of hard cancer not admitting of excision the injection of the acetic acid is well worthy of a trial, though as yet it has not often been employed, nor with much advantage.

## LECTURE XXI.

Medullary Sarcoma or Soft Cancer : its External Appearance, Anatomical Structure, Growth and Degeneration ; the constitutional evidences of its existence—Melanosis or Black Cancer—Treatment of the various Forms of Medullary Sarcoma, Fibro-plastic or Recurrent Tumours—Cases illustrative of the distinction between Simple and Malignant recurrent Growths.

IN my last lecture I concluded what I had to say with regard to carcinoma, and I now proceed to consider the MEDULLARY SARCOMA, CEREBRIFORM TUMOUR, or SOFT CANCER. These different terms indicate very well the general characters and appearances of the disease. When seen recently, the tumour is exactly like a portion of brain substance, and is therefore called cerebriform. The tumour is generally of a soft consistence, masses of brain-like matter occupying the interstices of a fibrous texture which composes the solid part of the tumour, and which is arranged in septa throughout. This fibrous tissue, as well as the soft matter, is truly malignant, and part of the tumour. After maceration, or when the tumour fungates, the brain-like matter disappears. Like carcinoma the soft cancer contains the peculiar proliferous cancer cells, though to a greater extent than in the hard cancer. The tumour varies as regards the degree of vascularity, but it is always highly vascular. On injecting one of these tumours, we find throughout the growth some portions of amorphous-looking matter not permeated by vessels ; but the greater part of the structure is seen to be very vascular. In some cases we find that a single large vessel enters the substance of the tumour, and forms a dilatation or sort of pulsating vascular pouch not unlike an aneurism. Occasionally, when the tumour is very vascular, the brain-like matter gives way after a time, and the fluid blood passes in from the ruptured vessels, and a sort of pulsating feeling along with fluctuation is produced. The femoral artery has

been tied in a case of cerebriform tumour under the belief that it was an aneurism.

This disease occurs at all ages, and may attack every part of the body, but most frequently the osseous textures, mammary glands, the testicles, and the glands throughout the body generally. In its vital manifestations or natural history, the cerebriform tumour differs from the hard cancer in growing much more rapidly—taking sometimes only two or three months to attain a large size, while the scirrhus proceeds with comparative slowness for a malignant growth. This characteristic should always be kept in view. There is not so much pain perhaps in the soft cancer as exists in scirrhus, but the pain is more continuous. Another character is the vascularity of the part, as shown by the venous enlargement: this may occur in other tumours from the pressure of the tumour obstructing the circulation, but in the later stages of medullary sarcoma it is a very constant characteristic. Ulceration proceeds rapidly, so does the fungation, and they soon involve the surrounding textures.

The pulse is generally very quick and somewhat irritable: the patient may not at first look anæmic or cachectic, because this tumour more frequently occurs before middle life than after—generally before thirty—while true scirrhus is rarely seen till after thirty-five. The patient may have a ruddy appearance, but there is generally a tawny colour of the skin. As soon as the tumour gets large, it unmistakably begins to affect the constitution—the patient begins to look anæmic and yellow, and there is some febrile excitement at night indicating the hectic condition. From the softness and brain-like consistence and vascular character of the growth, and from its occurring as it often does in organs which are circumscribed by a dense resisting membrane, as in the testicle or breast, we often have the tumour presenting a sort of elastic or fluctuating feeling, exactly like that of chronic abscess, so that the difficulty of diagnosis between them is sometimes great. Again, the contents of the tumour are not only cerebriform, but sometimes fluid or gelatinous, and then there is a distinct feeling of elasticity or fluctuation, and the difficulty of



diagnosis is increased. A correct diagnosis in cases of soft cancer is most important, because if one of these tumours be opened by mistake for a chronic abscess, a fungus will protrude, and the disease will spread much more rapidly. In all cases whilst the tumour affects both the lymphatics and the surrounding textures, yet it spreads more rapidly by directly involving contiguous structure than by the mere poisoning of the lymphatics. And even where it does not do so, being anatomically limited—as in the testicle, where it seldom affects the scrotum or the envelopes of the testicle proper for some time—it rather spreads along the cord, because it meets with less resistance. Yet when the tunica albuginea gives way, and the growth comes in contact with the tunica vaginalis, the other textures also very soon become involved.

One point is to be especially noticed—namely, that the muscles in the neighbourhood of a cerebriiform tumour, though not adhering to it, contain in their structure a large number of proliferous cells, some of which are identical with the cells of the growth. Even when the tumour has not burst through its resistant envelope or cyst, and where it is apparently circumscribed from the surrounding muscles, as in the arm, we find the muscles in the neighbourhood affected by the disease ; and this is important in regard to operations. In other cases, where there is no such limitation, the morbid growth rapidly involves every tissue, especially the muscles, and spreads by contiguity of texture.

When the tumour bursts it fungates, and from that fungus we sometimes find projecting dark-coloured bleeding masses as in medullary sarcoma of the orbit. Here we have a fungoid mass projecting from the eyeball, from which blood is constantly trickling, and which bleeds profusely on the slightest touch. This has been described as a special tumour under the name of fungus hæmatodes. As regards the history of the tumour, we often find that it is attributed to very slight causes, and that it supervenes on accident or some comparatively trivial disease, and in many instances the tumour closely resembles diseases of a much



less serious character. In one case the patient got a blow upon the testicle, which was followed by hydrocele; this was tapped, and the man was quite well. Afterwards he again hurt his testicle slightly; it then swelled very rapidly, and was again tapped, but this time a liquid like hæmatocele fluid came away, and the swelling increased very rapidly. Here the history was very like that of hydrocele converted into hæmatocele from the irritation caused by the injury. The patient then came under my care; the tumour was removed, and on examination was found to be a soft malignant growth of peculiar character which you see in this preparation. In another case a boy received a blow with a stone between the eyes. An abscess followed which was opened. A good deal of bleeding occurred from time to time, which afterwards became more profuse. The appearances were not unlike those of necrosis of some of the bones, but a soft cancerous tumour formed, which assumed the form of fungus hæmatodes, and ultimately proved fatal by repeated loss of blood. These cases show that a soft cancerous tumour may resemble very closely other diseases.

Another form is much firmer, sometimes almost solid and semi-cartilaginous at some points, while cerebriform at others, but it does not differ in true character or vital manifestations from the ordinary medullary sarcoma. But there is a form where the tumour is much more firm and equal, slower in growing, and the structure of which is much more regular, and contains much fibrous tissue, very like the simple recurrent tumour. Its development at first is slow, its structure more equal, and it does not spread so directly by contiguity; but after a certain time it grows quite as rapidly as the cerebriform tumour, and then involves other textures by contiguity of structure. It is only a modification of the medullary sarcoma.

Another form of soft cancer is that termed MELANOSIS or BLACK CANCER. It is very distinct in appearance from the other forms of soft cancer, its colour being always dark brown or black, though it is the same as ordinary cerebriform tumours in its history and vital manifestations. It is of a very soft consistence, and

frequently occurs in the skin or sub-cutaneous tissue, occasionally in the testicle, but most generally in the orbit, either as an independent tumour round the optic nerve or as a tumour within the eye-ball itself. All its other characters are the same as in ordinary medullary sarcoma, with the tendency to fungate and ulcerate and spread by continuity of texture. When the tumour commences in the eye-ball itself, the case is not so favourable as when it lies external and does not affect the nerve; then it is at first circumscribed by a cyst of its own, and there is comparatively little risk of its return if removed early.

The melanotic cancer has this peculiarity—that a form of it occurs in the lower animals which cannot be distinguished from the black cancer in man. But in the former case it is not malignant and has no tendency to return after removal, while in the human subject it is plainly and certainly a malignant disease—a melanotic form of cerebriiform cancer.

With regard to the *Treatment* of the various forms of soft cancer, we may say that the same rule applies here as in carcinoma, though, if possible, more strongly. Whenever the disease is limited, and in the early stage, then operate at once, for the tumour, if left alone, will very soon involve other textures, and there will be no limitation. When it occurs in a comparatively limited organ, such as the testicle or breast or in a gland, remove the growth as soon as possible; if we put off doing so the delay is almost sure to lead to fatal consequences. We must, however always remember that the term limitation is used in a comparative sense, for there can be no such thing as absolute limitation of a really malignant growth, so long as the circulation of the fluids through the body continues. Practically there is a great difference between an organ which is anatomically limited, such as the testicle, and a part of the body not limited at all, as the skin or soft textures of a limb. In a limited organ we rarely, if ever, find that the disease returns in the same part, or in the same neighbourhood after early removal, though it may do so in other organs. We must remember that when this tumour ulcerates and fungates, we can do less even to palliate the disease than in the hard cancer.

We may employ opiates internally, and anodyne applications to the part with the perchloride of iron to check any bleeding from the fungus, and we must support the patient's general health by proper diet. This, however, will only relieve for a short time, and hence the necessity for removing all cerebriform and melanotic tumours early, for here it is even greater than in the case of hard cancer. The injections of acetic acid have not been tried yet in cases of soft cancer, though there is nothing to prevent their use; the acid might, from the softness of the tumour, destroy its cells more easily than those of scirrhus. There is both in the hard and soft cancer a risk of exciting irritation by the use of the acetic acid, and of causing the tumour to fungate more rapidly; but we would be perfectly justified in trying the injections, at least when the tumour had begun to fungate, because then very little can be done to palliate the disease.

FIBRO-PLASTIC OR RECURRENT TUMOURS.—The peculiarity of these tumours is that whilst they are perfectly non-malignant, they return after removal. A very large number of cases, however, which are termed recurrent tumours, are really growths of a malignant character, belonging to the medullary group of tumours. These differ in structure in the earlier stages from an ordinary medullary growth, in being firmer and more like a fibrous tumour, but they gradually tend to deteriorate locally and become softer, every recurrence of the growth being marked by a deterioration in its character. The simple recurrent tumour has none of these tendencies, and I believe it to be an exceedingly rare form of growth. The best authenticated case of pure simple recurrent tumour occurred in Edinburgh some years ago, in the practice of the late Dr. Maclagan. The patient was a young woman, and the tumour was situated on the back; it was removed on two occasions by Dr. Maclagan, and again by Dr. D. Maclagan at intervals of three to five years; and after it had been removed three times the patient was free from it for many years. When she was about thirty-five years of age the tumour again returned, and I had then an opportunity of seeing it. The tumour was growing in the immediate vicinity of the cicatrices of

the former operations, and presented a sort of tense elastic feeling. It had a transparent pinkish colour on the surface. At some points it was more dense than at others, and at one part it had ulcerated. It had also a long hardened base. In this case, after each removal, the tumour had been examined by Mr. Paget of London, who found the structure of it to be the same in every instance. When I removed it on the last occasion, it was examined by Dr. Haldane, and also by Mr. Paget, and no alteration whatever in its structure could be noticed. It was composed of a sort of fibrous texture, with a softish gelatinous-looking material filling up the interstices, and from its composition it received the name of fibro-plastic tumour. This condition is visible to the naked eye. The amount of soft material in the tumour may vary in amount, and may form a sort of nucleated mass at different points. Ten years after I had removed this tumour I saw the patient, and she was quite well, and there was then no tendency to a return of the tumour, its non-recurrence being probably due to some alteration in the constitution of the patient. This case was marked by the following symptoms :—the recurrence of the tumour took place at different intervals without any affection of the general health, and without any deterioration in the character of the growth itself. There were no symptoms of malignancy beyond the mere recurrence, and there was no tendency to involve other textures in the diseased action. It was therefore a simple recurrent tumour. Many recorded cases of such tumours are really not so, though they may be fibro-plastic in structure. The history of such a malignant recurrent tumour may be mentioned as a contrast to the former case. A man about thirty-five years of age had a tumour in the epigastric region, which was removed by a surgeon, and returned. Eighteen months or so afterwards it was removed a second time and again returned. Three years subsequently he applied to Mr. Goodsir to have it operated on, and I then saw it. It was removed thoroughly and completely the third time, but the man had now an anxious look and slightly anæmic appearance. This patient had, moreover, a tumour on the scalp, which, after the removal

of the former growth, was observed to increase very rapidly. This also was removed. It was highly vascular, and its section was exactly similar to that of the abdominal tumour—namely, fibro-plastic. The tumour on the scalp had only been growing a few months. The tumour on the abdomen was removed, as I have said, two or three times, and each time getting more softened, the patient's health gradually deteriorated, and he at last died, exhausted by the disease. This case, as compared with the former, was truly a malignant disease connected with the constitution, whilst the former was not malignant, but a simple recurrent tumour. The malignant is much more common than the simple fibro-plastic tumour, and is merely a sub-division of the soft medullary tumour, containing a larger amount of fibrous structure than usual, but still truly malignant.

In the true recurrent tumour there are not many free nuclei, nor are there the same proliferous cells present as exist in the malignant recurrent growths. In these, even though the malignant symptoms may not appear at first, yet they become more evident after each removal of the tumour ; while if the tumour be a true recurrent one, the patient's general health remains unaffected. In another case of malignant recurrent tumour in a young woman's limb, Mr. Syme removed the growth once. She subsequently applied to me with the tumour at the site of the old cicatrix. She would not submit to its removal a second time, and then the tumour sloughed out, but the edges—as in malignant growths generally—refused to heal. The malignant fibro-plastic growth has the same proneness to involve other textures, as all medullary tumours have, while the simple fibro-plastic or recurrent tumour exhibits no such tendency.



## LECTURE XXII.

Simple Tumours of Bone : their similarity to those of the soft parts—Exostosis ; its structure, character, and treatment—Enchondroma : its appearance and limitation to the part in which it occurs—Osteosarcoma : its great resemblance to ordinary fibrous tumours—Case—Osteocystoma ; analogous in its nature and progress to the ordinary fibro-cystic tumours ; treatment—Osteoma.

As I have already fully discussed the subject of tumour-growth in general, and also the characters of the principal special tumours of the soft parts, it is unnecessary to do more in regard to TUMOURS OF BONE than direct your attention briefly to some of their peculiarities. Tumour-growth in the osseous is the same as in the softer textures, only modified by the greater resistance and hardness of the structure in which it occurs. The peculiar mode of nutrition and development of bone, causes tumour-growth in it to be slower, and to have a greater degree of anatomical limitation. Again, as regards the special tumours of bone, each of these has its analogue amongst the tumours of the soft parts, whether in the simple or malignant groups. And in some instances, as that of medullary cancer of bone, the disease is not only analogous to, but very generally identical in structure and character with, the similar disease arising in the soft textures.

EXOSTOSIS is an osseous tumour corresponding to the vascular sarcoma. In the femur, humerus, and other bones, we meet with a tumour growing slowly, and perhaps not attracting much attention at first, being only troublesome from its interference with the action of the muscles of the limb. It grows from the bone, but, like a true tumour, not in the form of the bone, but as an outgrowth connected to it by a narrow pedicle.

• The structure of exostosis is simply that of bone, with Haversian canals in its interior. Its surface is rounded towards the deep aspect of the muscles, and sometimes covered with a



texture resembling cartilage of encrustation, so as to favour the action of the muscles. The tumour is generally attached to the bone by a narrow pedicle, but it may have a broad base. Its bulk externally appears to be much larger than it really is, on account of the thick muscles covering it. There is no character whatever of malignancy in this tumour ; it is of slow compact growth, and has no tendency to involve neighbouring textures.

The *Treatment* is much the same as in vascular sarcoma, though internal remedies are here useless. An incision is made over the tumour through the skin and superimposed muscles, and the pedicle of the tumour is cut through with the bone-pliers, or with a very fine saw, close to the shaft of the bone, but we do not require to remove any portion of the bone from which it grows. Inflammatory action takes place on the surface of section and closes it, and there is no tendency to the recurrence of the exostosis.

In many cases nature effects the same process herself to a certain extent, but always with more risk to the patient's life. The pedicle of the tumour sometimes breaks across, and the loose body is left moving about under the muscles. It loses its vitality and leads to suppuration. The abscess so formed bursts or is opened, and the dead portion of bone may be thus got rid of. This accidental occurrence shows us the proper treatment of such a tumour, and even under these circumstances there is no tendency to its recurrence.

In that part of bone where there is cartilage, as in the epiphysis, a tumour is sometimes developed which is analogous to the fibro-cartilaginous tumour of the soft parts. This is called ENCHONDROMA. It often occurs in the heads of the metacarpal bones, but neighbouring metacarpal bones rarely become affected, as the tumour does not involve other textures. The growth looks just like a mass of cartilage. After a time there may be some deposition of earthy matter in the cartilaginous matrix, but the cartilaginous condition is the more obvious. It is a simple tumour limited to the texture in which it occurs, and when removed has no tendency to return. Amputation of a finger is

often performed for such a tumour occurring in one of the metacarpal bones. It would be perfectly safe to remove the diseased metacarpal bone alone, but the finger so left would be a very useless one, and hence amputation of the finger is generally preferred.

OSTEOSARCOMA is a tumour of bone analogous to the fibrous growth in the soft parts. The term is sometimes used to imply a malignant growth, but it is really a simple tumour, containing organic or fibrous matter blended with the osseous, and assuming almost a fibrous character. It is perfectly simple, has no tendency to involve other textures, and must be carefully distinguished from certain other tumours of bone, such as cancer of bone or osteocephaloma. Sometimes the osteosarcoma is exceedingly like an ordinary fibrous tumour, a section of the one being hardly distinguishable from that of the other. The tumour is perfectly defined and circumscribed naturally, and can be easily dissected out. It is exactly analogous to the fibrous tumour of the soft parts in all its vital manifestations. Its development is very slow ; but if left alone it may attain a large size. In one case of enormous osteo-sarcoma which ultimately came under my care the application of caustics and iodine had caused the tumour to ulcerate. Amputation was performed under unfavourable circumstances—the patient being very cachectic and exhausted by constant bleeding and discharge from the tumour in consequence of necrosis of the osseous matter of the growth. The great vessels and nerves of the limb passed through the tumour, but were not truly involved in it. There was an enlarged gland in the axilla ; but from the history of the case and the feeling of the tumour I knew the growth to be a simple one, and I accordingly amputated the arm. The patient made a good recovery, and there was no tendency to any recurrence of the tumour. One peculiarity in this case was that the tumour involved both bones of the forearm, while in the metacarpal bones, though the whole hand seems to be involved, yet almost always it is only one finger that is affected ; the other bones are pressed upon, but are not involved in the disease. The tumour in

TUMORS.





the above case began in the ulna, and as it enlarged it encroached upon the interosseous space, which was destroyed by the pressure. The osseous surface of the tumour at last became blended with the radius, and then, having the same vascular supply, both bones became affected, but not in the same way as occurs in malignant growths. The two bones simply coalesced from the pressure of close contact, and from their vascular supply becoming the same, but this only took place at a very late period of the growth of the tumour.\*

The *Treatment* of osteosarcoma is very simple—namely, early removal by excision or amputation, just as in the simple fibrous tumour of the soft parts. It should never be tampered with, but removed as early as possible, as we may thus be able to save a great part of the bone. There is no reason for delaying the operation, as the tumour is sure to increase in size, and its removal is then rendered more serious.

The term OSTEOCYSTOMA denotes a cystic tumour of bone, which is analogous to the fibro-cystic tumour of the soft parts. The various small cysts, which always exist in the interior of the fibrous matter of fibro-cystic tumours, may unite into one large cyst, or one cyst may develope itself at the expense of the others, enlarging and compressing them. In bone the progress is somewhat analogous. A cyst very often forms which contains a sort of fluid matter, the walls of the cyst being composed of the denser portion of the bone. By removing the anterior part of the cyst—and so giving free vent to its contents—and painting its interior afterwards with iodine, we very frequently find that the cavity contracts, the texture becomes condensed, and no recurrence of the tumour or other bad consequences follow. When, however, the bone is very much altered in form, then a part of the bone itself should be removed along with the cyst. We may open up the cyst in its earlier stages, or afterwards remove it together with a portion of bone on either side, or amputate the limb close to the tumour, without any fear of reproduction of the growth. This cystic

\* *Edinburgh Monthly Medical Journal*, March 1854.

tumour of the femur which I show you is perhaps the most remarkable specimen of the disease in any museum. The case occurred in the practice of the late Mr. Liston.

Formerly the term *spina ventosa* was applied to these tumours, as well as to expansion of the bone by abscess ; this arose from erroneous notions of the pathology derived from looking at dried specimens, such as this.

There is a tumour arising from enlargement of the bone itself, termed *OSTEOMA*, which is really a form of exostosis. It is chiefly found in the lower jaw ; and when removed by excision has no tendency to return.



## LECTURE XXIII.

Malignant Tumours of Bone and their Analogues in the other Textures—Their Symptoms and Effects, Local and Constitutional—The Parts most liable to be attacked by them—The conditions under which Malignant Tumours may be modified anatomically, and how these should Influence our Treatment—Case—Osteoid Cancer.

THE MALIGNANT TUMOURS OF BONE are analogous to, or are identical with, the malignant tumours in the soft parts, with perhaps the exception of the hard cancer. OSTEO-CEPHALOMA, or CEREBRIFORM OSSEOUS CANCER, presents all the appearances of ordinary medullary sarcoma, except that there are spicula of bone occasionally in the tumour, from the denser osseous texture giving way more slowly than the soft textures. Very soon the whole bone becomes involved, so that we often could not tell where bone had existed. There may be no appearance of earthy matter, the whole being converted into a medullary mass.

The form of malignant disease in bone which corresponds to scirrhus or hard cancer is to some extent modified by the texture in which it occurs, its appearance being different from scirrhus in the breast, though very like that disease in the liver. At first, in this disease of bone the medulla is chiefly affected; it becomes altered in structure and contains a sort of amorphous-looking deposit, with numerous cancer cells in it. The Haversian structure yields very rapidly, and the cavity becomes filled with a mass of diseased texture. This condition extends towards the denser part of the shell of the bone, and fracture of the cancerous bone may take place. The disease is generally attended with pain, of rheumatic character, and often supervenes as one of the terminations of cancer in the soft parts, as the breast or testicle. The whole system is contaminated, and deposits take place into the textures of the body generally, and then the bone becomes

affected. The cancerous deposit often takes place in circular tuberos masses, just as we find it in cancer of the liver.

These malignant tumours may attack any part of a bone, the condyloid portion or the shaft. In bones where there are hollow spaces, as in the upper jaw, or even in the lower jaw, the soft malignant disease generally develops itself either within the bone or between it and the periosteum. In different bones or bony cavities, however, there are some points of difference. If the disease develops itself within the shaft of a bone such as the femur or humerus, then we have a very considerable degree of limitation, perhaps the most distinct limitation anatomically that we can have in the body. The malignant disease is limited so far as it can ever be said to be limited, and hence the local disease can be more thoroughly removed when occurring in the shaft of a bone than when it is in the soft parts. It is shut off, as it were, from the neighbouring textures by the dense osseous walls of the shaft, by the strong fibrous periosteum investing it, and at either extremity by the articular cartilage. Hence this is plainly very different from the same disease occurring in the softer textures, commencing external to the bone and affecting it secondarily, where all the textures become rapidly involved in the diseased action, and no anatomical limitation whatever exists. To profit fully by the limitation, however, it is evidently necessary to amputate at the articulation beyond the tumour, not through the continuity of the diseased bone, so that the cartilage of encrustation may form a complete barrier. At the same time, we must remember that even where the tumour is limited to a bone, there is a great tendency to the appearance of the proliferous cancer-cells in the texture of the neighbouring muscles; and hence in such cases we ought to remove the muscles wide of the diseased condition. Certain bones present more limitation to tumour-growth than others—the lower jaw for example. In tumours of that bone situated between the symphysis and ascending ramus, we should always disarticulate even though part of the bone may seem to be unaffected. From the original development,

the texture at the symphysis helps to limit the disease at the mesial line, so that we may safely remove half of the lower jaw, as there is sufficient limitation, and there is no greater tendency to the return of the disease than in the femur or other long bones. Of course malignant tumours of this kind are never to be considered so favourable with regard to prognosis as simple tumours of bone ; there is always a greater tendency to a return of the disease, and also a greater risk of pyæmia supervening after operation.

Whilst we may remove the lower jaw for these tumours at an early period in some cases, in regard to the upper jaw, on the contrary, the conditions are entirely different. In it the antrum of Highmore is not truly limited ; and, moreover, the so-called tumours of the upper jaw do not always occur within the antrum, and even if they do, the diseased condition extends, and projects into and affects other parts. It may even begin in the turbinated and ethmoid bones, and spread to the superior maxilla ; so that in tumours of the upper jaw the disease is by no means necessarily confined to that bone. In such tumours of the upper jaw we may have a sort of polypus projecting into the nostril, with pain felt in the face occasionally, and the eyeball protruded and everted. If the eyeball is merely thrust forwards and upwards, the case is not so unfavourable, as it may depend on the pressure of the tumour on the floor of the orbit ; but if the eyeball is turned outwards at the same time, we should avoid all interference, for this condition shows that the tumour has arisen in or has affected secondarily the orbital plate of the ethmoid bone, and probably the base of the cranium ; there would therefore be no limitation in such a case. The walls of the antrum of Highmore also are very thin, and soon become involved in the diseased action, and thus there is no definition ; so that, though we might remove part of the tumour, we could not remove the whole. We may, however, interfere occasionally to palliate the disease if we do so early. In one case the patient at first was affected with a swelling of the antrum of Highmore, which projected towards the mouth. There was no eversion of the

eyeball, and the tumour was supposed to be an abscess in the antrum. An incision was made into it, and a projecting part of the tumour was removed. This caused the tumour to adhere to the whole cheek, which soon became involved. The patient subsequently came under my care, and I removed the upper jaw, as the tumour was defined posteriorly and towards the orbit. All the adherent portion of the cheek was removed, and so I had to dissect a large flap from the neck to fill up the gap ; yet the wound healed, and the woman left the hospital apparently well. After some time, however, a similar tumour formed in the opposite antrum, and ultimately the disease destroyed the patient. If in this case—instead of the partial operation—complete removal of the jaw had been performed at first, while the cheek was still unaffected, then possibly the operation might have been successful, or at least several years might have elapsed before any return of the disease occurred.

A tumour of the upper jaw, then, differs from one of the lower or from one in any long bone, as there is not the same limitation in the upper jaw. What limitation there is, is so thin that it is easily broken up by the mere pressure, and by the destructive character of the tumour ; and when one of the symptoms present is eversion of the eyeball, we are not warranted in interfering, as this symptom shows that if the disease has not begun in the ethmoid bone, it has at least affected it secondarily. Therefore, while in most cases of malignant disease in bone we may interfere with greater propriety than if the disease were in the soft textures, on account of the anatomical limitation existing in bone ; yet there are exceptions to this rule, depending on the structure of the bone and its anatomical relations, as in the case of the upper jaw.

OSTEOID CANCER is a very rare form of cancer in bone, which is not often described, and which might at first be mistaken for a simple exostosis. The tumour occurs in young persons, grows slowly, and generally arises in the condyloid portion of a bone. When manipulated, it resembles very closely an ordinary exostosis ; but after a time the disease increases very rapidly. There

is not the same definition in the osteoid cancer as there is in the exostosis. The tumour rapidly develops itself and gradually involves the condyloid portion of the bone. The cachetic appearance of the patient, the rapid growth of the tumour, and the quick pulse, all indicate the true nature of the disease. The growth itself is very dense and hard, and feels like ivory, which renders its diagnosis more difficult. Softening gradually takes place at some parts; but the great mass of the tumour is very dense. The disease is one rarely met with. In two cases which occurred in my own practice, amputation was performed; in one of these the disease returned in another part of the body and destroyed the patient. This tumour belongs to the carcinomatous form of malignant growth, its cells being exactly like those of carcinoma.

There is another form of malignant disease affecting the condyloid parts of bones, which in its early stage is often difficult to diagnose from joint-disease. It generally occurs about the elbow and knee joints. There is at first some slight swelling, with little pain, and we are apt to treat the disease lightly; but we ought to watch such patients very carefully, for, after a time, symptoms come on which give us an indication of the true nature of the disease. Then it develops itself very rapidly, owing to the loose reticular texture of the condyloid part of the bone; and a section, as you perceive, presents appearances almost exactly similar to those of the medullary tumour of the soft textures.

*The Treatment* is the same as in other malignant tumours of bone—early amputation wide of the disease.



## LECTURE XXIV.

Syphilis, its meaning and modes of propagation—its division into primary, secondary, and tertiary—Primary Syphilis—outline of the characters, appearances, and symptoms of Hard and Soft Chancres—the treatment of each form.

TO-DAY, Gentlemen, we commence the consideration of a form of diseased action of a very peculiar nature, inasmuch as, whilst it originates in the local absorption of animal poison, it not only gives rise to constitutional symptoms, but so affects the general system as to induce a true diathesis or constitutional taint, which, instead of terminating in the individual, may be transmitted to his progeny. I refer to

SYPHILIS.—By the term syphilis we mean a diseased condition induced by the introduction of a peculiar poison—the syphilitic virus—into the system. It arises generally from impure sexual intercourse, and, consequently, most frequently attacks the genital organs; but is capable of affecting other parts by inoculation, as we see occasionally in medical men getting some of the poison into a cut or scratch on the hand. Again, by direct inoculation with the virus, we can produce the sores in other parts of the body besides the genital organs. The diseased condition is generally attended with constitutional effects, resulting from the primary local sore, and hence we speak of the local and constitutional symptoms of the disease under the heads of primary, secondary, and tertiary syphilis. The *primary* symptoms are the local primary sores or Chancres, and a certain degree of febrile action which generally accompanies them, varying in degree in different cases. The *secondary* symptoms are the bubo, the acute syphilitic sore throat, the different forms of skin eruptions, syphilitic iritis, condylomata, and warts. The *tertiary* symptoms include all the more chronic and formidable effects induced in the constitution by the original primary



sore, such as disease of bone, chronic affections of the larynx, chronic eruptions, disease of the brain, lungs, liver, kidneys, and other internal organs, accompanied occasionally with specific deposits in the tissues of each, and a peculiar cachectic condition of the patient.

As surgeons, our chief concern is with the primary and secondary forms. Tertiary and congenital syphilis we must consider more briefly. Meantime I direct your attention to

**PRIMARY SYPHILIS.**—The primary local affections may be divided, for all practical purposes, into two forms—viz. the simple or soft chancre, and the indurated, Hunterian, or true chancre. The simple chancre is characterised by the shallowness of its surface, which is of a dirty-yellowish colour. It exhibits but little action either in extending or in its tendency to heal. It is a sore prevented from healing by specific action. There is no hardness of the edges, and though they may be irritable, they are generally without any deposit or thickening below them, and there is frequently more than one ulcer present at a time. Some apply the term abrasion or excoriation to the simple sore to distinguish it from the true or Hunterian chancre; but this is an improper use of terms; for an abrasion may arise from many causes which are non-syphilitic, such as some local irritation, or even from want of cleanliness. The simple chancre presents the above appearances, but it must not be confounded with a simple abrasion of the mucous membrane of the prepuce or glans penis arising from non-syphilitic causes. An abrasion is never followed by any constitutional effects, whilst the simplest form of soft excoriated chancre may be followed by very distinct secondary and even tertiary symptoms.

The indurated or Hunterian chancre generally exists as a single sore. It begins as a pimple or pustule with a hard base; the apex or superficial aspect ulcerates, and extends more or less rapidly by ulceration; after a time it proceeds more slowly, the hard base extending and forming an indurated ring round the sore. Like the soft chancre, the hard chancre is slow of healing. The sore may commence on the side of the integu-

ments of the penis, or on the prepuce, and whilst it extends in surface the hard base continues to extend likewise. The ulcerated surface may heal and yet the induration remain, so that in the prepuce we often find an indurated mass remaining after the ulceration has healed, from which the diseased condition may spread. As the ulceration goes on, the edge may become less marked perhaps, but there is still left a dense ring or margin, very distinct from that of the simple chancre. Even in cases where, from particular local action taking place, phagedæna or sloughing occurs, and where there may be great loss of substance, still the hard margins remain to mark the true character of the sore, and hence this may be considered as one of the most characteristic features of the Hunterian chancre. The constitutional effects following on the indurated chancre are most marked, and it is on this account called the true as contrasted with the soft chancre.

*Unity and Duality of the Syphilitic Virus.*—Some hold that the different characters of the primary sores and of their effects show that there are two distinct forms of the poison—one much more virulent than the other; but from what I have seen myself of the disease, and judging by the evidence adduced, I do not believe in two distinct poisons, though I consider that the poison may differ in degree rather than kind, and that the same poison may produce different forms of sores, owing to the susceptibility of the part affected and other conditions. In proof of this, it has been found that two men have been affected with different forms of sore from the same woman; and several instances of this occurrence are recorded.

As regards the secondary symptoms, we can never tell when they may arise. The character of the soft chancre generally shows that the poison has been less virulent; but, at the same time, secondary symptoms may follow under certain constitutional conditions: even when the soft chancre has healed, and in cases where no hardness whatever had existed, I have seen secondary symptoms ensue. The simple soft chancre is much less likely to be followed by constitutional symptoms than the

indurated ; but we ought never to trust to this, nor tell our patients that there is no risk of after symptoms occurring.

*Treatment of the Soft Chancre.*—The treatment is to destroy the sore as early as possible with caustic—nitrate of silver and sulphuric acid being the best forms of caustic for the purpose. The escharotic should be applied thoroughly, so as to destroy the sore completely. This application causes a slough to separate, and the sore then generally heals. When we want to be quite sure of destroying the sore, we should employ sulphuric acid, as it chars the surface completely, and the slough separates more quickly than after the use of the nitrate of silver. After the slough has formed and is separating, warm-water dressings should be used—a piece of lint, cut to the size of the sore, is soaked in warm water and applied, the prepuce being brought over the part. This should be changed frequently, and the parts around washed with a weak alkaline lotion, when the dressings are changed, so as to prevent any tendency of the discharges to cause similar soft chancres. The alkaline lotion destroys the potency of the virus to a great extent. Attention to cleanliness is very important, for much of the virulence of the disease depends on a want of cleanliness. After the slough has separated, and when the wound has so far healed, the most useful remedy is the weak black lotion : this is far the best lotion, but we must take care not to use it stronger than four grains of calomel to the ounce of lime water, if of greater strength it might irritate the parts ; but here, as with all other sores, we must attend to the appearance of the ulcer under the use of the lotion, as it may lose its effect, though generally it causes the sore to heal rapidly. When the black wash does not answer, the weak sulphate of copper lotion, or the chlorinated soda, or sulphate of zinc lotions, are very useful, but they are not often required.

One important point in the local treatment of all syphilitic sores is perfect rest. The patient should be kept recumbent, and the penis suspended towards the abdomen—at least for a few days. If the penis be allowed to hang, it will give rise to increased irritation and vascularity. Rest is absolutely

necessary ; but it is generally very difficult to get the patient to remain quiet and not go about as usual.

*Treatment of the Indurated Chancre.*—Here we require to be very active in our treatment. If we see the case early we must destroy the sore thoroughly and completely by another form of caustic—viz. potassa fusa, which is by far the most certain and effective caustic in destroying the indurated chancre. We must apply the caustic, not only to the surface of the sore, but also to its hard ring or base. As the potassa fusa is a very diffusible caustic, care must be taken not to let it spread too much ; and for this purpose a little vinegar or lard should be applied, so as to check the too extensive progress of the caustic. The potassa fusa is preferable to nitrate of silver in cases of hard chancre, for the nitrate does not affect the deeper part of the sore, but merely destroys its surface. Nitric acid, likewise, does not reach the deeper part of the sore, and is perhaps less valuable as a caustic than the nitrate of silver. The potassa fusa destroys the whole sore, and though very painful at first, the pain is lessened as we work down to the base, the vitality of the parts being destroyed. Another advantage of the potassa is, that its alkaline quality tends to destroy the virus more completely than any other caustic. Sulphuric acid is not so applicable to the hard chancre as the potassa fusa, for the sore is generally raised, and a fluid caustic cannot therefore be well applied. Hence, of all caustics the potassa fusa is the most readily applied, the most complete in its action, and produces no undue contraction of the parts afterwards ; but if we wish to do any good, we must be very careful to destroy every portion of the hardened base of the sore. After the chancre has been destroyed by the caustic, a poultice should be applied till the slough is quite separated. There is then an apparently increased surface of sore, but this is due to the retraction of the skin. Afterwards the black lotion should be applied, unless the sore has assumed an irritable condition. This lotion is even more beneficial in the hard than in the soft chancre ; the sulphate of copper lotion (3 or 4 grains to the ounce), or the sulphate of zinc (2 grains

to the ounce), may also be used occasionally. This sore does not heal so rapidly as the simple chancre. There is a greater specific constitutional cause in action, and the ulcer sometimes remains, not extending, but in a sort of passive condition, showing no tendency to heal, though as soon as the healthy action is once established, the sore generally heals quickly. In some cases, after we have destroyed the hardened base, though more generally when the base has not been thoroughly destroyed, the hard edge reappears, and the sore seems to be deep. When this occurs, the potassa fusa must be again applied to the edge, and slightly also the surface of the sore; but we cannot now be so sure of destroying the whole surface as at first.

In both the hard and soft chancre we meet with a certain amount of febrile excitement: sometimes it is very slight, but in all cases of venereal sores it is present, and particularly towards night; in some cases it is very marked, and then we require to have recourse to certain remedies, such as acetate of ammonia, and other febrifuge mixtures, along with a little ipecacuan. The bowels should be kept open by saline laxatives, and strict attention paid to the diet, which should be non-stimulating. During the treatment of the primary sore rest, as already stated, is absolutely necessary.

The indurated sore in many cases refuses to heal; it remains quite stationary, the edges show no tendency to contract, and its surface begins to assume the dirty-grey sloughy appearance it had at first. If this happens after all the ordinary local remedies have been used, then we should lose no time in having recourse to constitutional remedies—viz. preparations of mercury or of iodine, which seem to have a specific action on the diseased condition. Some surgeons in the present day never use the mercurial preparations, but trust entirely to the preparations of iodine, especially the iodide of potassium; but in the treatment of the primary indurated sore, I have no more confidence in the iodide of potassium than I have in so much water. It is very useful in secondary syphilitic affections, but not in the primary stage of the disease, and it is of no use whatever as a



prophylactic to prevent the accession of secondary symptoms. As a remedy to promote the healing of the indurated sore, I have no faith in it, but as a remedy in secondary, and in some forms of tertiary syphilis, it is very valuable. The remedies most to be trusted to are the preparations of mercury, given in small doses, and only when the sore does not heal readily. Mercury is not to be given in every case as a prophylactic, or to cure the primary sore, unless it refuses to heal under the use of the ordinary remedies. Mercury has fallen very much into disrepute from its having been formerly pushed to an excess. It used to be considered as a specific for all venereal cases, even for gonorrhœa ; and in all sores, whether they were healing or not, it was given as a prophylactic in large quantities, the patient being expected to spit so much saliva every day. But this was merely the abuse of a very useful remedy. In many cases, undoubtedly, mercury will produce symptoms very like those of secondary or tertiary syphilis, but except in certain constitutions, mercury in small doses is the proper remedy to give when the indurated sore refuses to heal. It is sometimes said that secondary symptoms do not follow after an indurated chancre which has healed rapidly ; but this mistake arises in great measure from patients being told by the surgeon that there is no risk of secondary symptoms coming on after the primary sore is healed. If, however, as not unfrequently happens, secondary symptoms do appear, then the patient, losing confidence, applies to another surgeon for advice, and hence arises the fallacy as to the non-occurrence of secondary symptoms after an indurated chancre. In the Lock Hospital, however, especially among the female patients, who are necessitated to come back to the hospital for treatment, it is found that secondary symptoms do follow, even though the primary hard chancre has healed rapidly.

The mercurial treatment should not be pushed too far ; the simple blue pill or the iodide of mercury in small doses may be given until the slightest fœtor in the breath is produced, or until very slight salivation occur, and then the mercury should be discontinued. We may afterwards use some gentle saline laxative



—not purgative—combined with quassia, and after a time a few doses of iodide of potassium (in five-grain doses), though this remedy is not to be trusted to at the first. There is one condition of sore, however, in which we should not use mercury at all, and that is where the sore is very irritable, or where there is any tendency to phagedæna. In such cases the mercury is contra-indicated ; it is not a safe remedy where there is much irritability of constitution, or where there is much local irritability of the sore, or much febrile excitement.

The phagedenic venereal sore is met with at certain seasons, and as the result of certain forms of virus, apparently where it appears to be more virulent than usual, or from a want of cleanliness, or in certain states of the atmosphere ; under one or more of these conditions the sores have a tendency to take on this action. In such cases the phagedæna proceeds in a variety of forms ; we have it assuming the acute irritable form with a black slough, and the whole prepuce sloughing, leaving the glans exposed, or the glans itself being involved rapidly ; the phagedenic sore also assumes an irritable, ragged appearance, but without any great degree of inflammation of the penis, and with no black spot, but proceeding quite as rapidly as in the former case. Sometimes it goes on more slowly, apparently as a simple sore, but undermining and destroying the integument of the penis. Sometimes the phagedæna proceeds very rapidly, as in the gray phagedæna, with a dark-gray slough, and the edges everted, but without the intense erysipelatous inflammation of the black phagedæna ; occasionally its progress is excessively rapid, the whole penis in front of the sore becoming gangrenous in less than twenty-four hours. We require to be very active in our treatment of the phagedenic chancre ; the surface of the sore must be destroyed with sulphuric or nitric acid to get rid of the unhealthy action, and then charcoal poultices and Condyl's lotion, or carbolic acid lotion or oil applied. If there be any tension it must be relieved, sometimes even by making punctures or incisions along the sides of the penis ; if there be phymosis, the prepuce should be

slit up. The bowels should be kept open, and a nutrient, but non-stimulant diet given, and febrifuge mixtures to allay the febrile excitement, as in cases of irritable gangrene. In some cases we require to give stimulants to support the strength, but generally in the acute stage a non-stimulating diet should be given. Perfect rest must of course be enjoined. From the rapid spread of the ulceration, a good deal of bleeding may occur, but this natural depletion does good rather than otherwise. In the phagedenic chancre we must avoid the use of mercury, which is not likely to do good, and very apt to do harm; the diseased condition must be treated on the general principles of treatment in ordinary phagedæna, which have been already explained.

## LECTURE XXV.

Secondary Syphilis—Bubo, Acute and Chronic—Syphilitic Sore Throat—Syphilitic Affections of the Skin—Papular, Pustular, Squamous, and Vesicular—Their Treatment.

SECONDARY SYPHILIS.—The secondary symptoms of syphilis include the different forms of skin eruptions and diseases, accompanied by some febrile action ; certain local conditions, such as bubo, phymosis or paraphymosis—the two latter may also accompany the primary sore—the syphilitic sore throat, the various syphilitic warts, condylomata, and fissures. The skin diseases are generally spoken of first, but as a rule the bubo takes place before the skin eruptions.

The BUBO is one of the local conditions ; it is secondary to the primary sore on the penis, but occurs almost simultaneously with it, and sometimes occurs as a special form (*bubon d'emblée*) in the first instance before the appearance of the sore on the penis. Thus, when there has been no sore on the penis, but where a bubo has existed, we sometimes have the secondary symptoms appearing after the usual interval, but this form of bubo is exceedingly rare, and some even deny its existence altogether. I have seen at least two well-marked cases of patients admitted with suppurative bubo, without any sore, in whom chancre appeared on the penis eight or ten days after being in hospital. This form of bubo arises apparently from absorption of the virus from the surface of the mucous lining of the prepuce or glans penis, and the constitution becoming affected in consequence. The ordinary bubo is simply a glandular abscess occurring in consequence of the irritation produced by the sore on the penis, and also in consequence of the poison being conveyed by the lymphatics from the part affected. In a case of ordinary gonorrhœa it is very common to find several glands in

both groins affected with enlargement, redness, and pain, and sometimes even suppurating ; but these symptoms generally pass off as soon as the painful stage of the gonorrhœa ceases, and there is little tendency to suppuration. A bubo may arise from an ordinary non-syphilitic abrasion of the penis, just as we have buboes in the groin arising from some irritation about the toenails ; but in the syphilitic bubo the poison is conveyed by the lymphatics into the gland, where it seems to be elaborated, and the pus which forms in it produces exactly the same effects as the syphilitic virus, and by inoculation with such pus we can produce a chancre like the primary sore.

The progress of a bubo is simply that of a gland going on from inflammation to suppuration and sometimes to ulceration. In the earlier stages we have it marked by hardness of the gland and redness on its surface, and after a time the agglutination of the textures with the cutaneous surface ; the inflammation extends, the parts soften, and the abscess points, and ultimately, if left to itself, ulcerates and bursts. In the earlier stages several glands may be enlarged, but in true syphilitic bubo we seldom have more than one gland affected. There the diseased condition seems to concentrate itself and the inflammatory action goes on to suppuration. Patients are very often anxious to have the tumour discussed, to prevent this result. With this view the best treatment to adopt is to keep the patient at perfect rest in the recumbent position ; apply acetate of lead and opium, or muriate of ammonia lotions, either cold or tepid, to the surface of the bubo, and put the patient on antiphlogistic regimen and diet. Sometimes, at the very first, and before there is any redness on the surface, or before any great amount of inflammation is present, the ectrotic treatment of bubo by pressure is employed. Firm pressure is applied over the gland, so as to give rise to discussion and prevent inflammatory swelling going on ; but this is seldom beneficial, and often tends to increase the irritation. The pain caused by the pressure is almost intolerable, and, moreover, it can only be employed at the very first, in the stage when the surgeon rarely sees the bubo.

The treatment by rest and warm or cold applications to the gland will sometimes prevent the swelling going on to suppuration, though how far this is beneficial is very doubtful, for in the true syphilitic bubo there is more or less absorption of the venereal poison into the gland, and it is better that it should suppurate, discharge, and so eliminate the poison, than that the deobstruent effects of the remedies used should cause absorption of the virus into the system. It is difficult to prove that there is any danger of the absorption of the virus ; but I have noticed that secondary symptoms have often followed more rapidly and more seriously in cases where the bubo has been discussed than where it has not. In spite of all remedies, however, the bubo generally goes on to suppuration, and then the best treatment is to apply warm poultices to the gland, keep the patient at rest, and prevent any unnecessary irritation of the parts. When the abscess is fully matured, then open it from one end to the other ; if we open it when there is only a small quantity of fluid in it, the tendency is for the hard matter left to act as a foreign body, and sinuses are apt to form in the neighbourhood. In all cases I prefer to let the bubo mature as quickly as possible, and when suppuration is fairly established then to open it thoroughly and completely, passing fairly beyond the base of the swelling on each side, so as to lay it well open. This will prevent the risk of sinuses forming subsequently. If there be any portion of the gland still left, and if it be at all troublesome, we should destroy it with *potassa fusa* or nitrate of silver, and so get rid of the hardened texture. Then apply poultices, and treat it like an ordinary abscess, applying after a time chlorinated soda and other stimulating lotions, and repressing unhealthy granulations. If there be any undermined integument at one point, it is better to lay it open as the bubo is contracting ; if we allow one sinus to form, others will form in connection with it.

The above is the treatment for the acute bubo, but the chronic form is much more difficult to deal with. Here the gland is large and painful, but it does not go on actively to suppuration ; there is not the same pain and tension that there is in

the acute bubo, and the inflammation is of a sub-acute or chronic type, the integuments are rather purplish than red. After some time we may feel a little fluid in the gland, which, however, seems to pass off, and the gland appears to be the same as before, and then becomes indurated. In this form of bubo, a good deal of time is often wasted in the treatment by applying poultices, and giving a more stimulating diet, which really do very little good. Much the most effective plan is to apply a blister over the bubo, which will either discuss it, or cause it to suppurate—more generally the latter. The blister excites a more healthy action, and we get rid of great part of the exudation, whilst the gland texture of the bubo proper is stimulated to more active suppuration, and once it is brought to the suppurative condition, the treatment is the same as that of an acute bubo. When there is much hard gland texture, it is well to destroy it with *potassa fusa*, which also excites a more healthy action the unhealthy parts, instead of leaving a chronic condition. When the skin of the bubo is very thin at certain points, and the great mass of the bubo hard, with little boggy points here and there, and a feeling of some thin fluid at intervals in the swelling, and when the skin is of a bluish colour, a very good plan is to open the bubo with *potassa fusa*. This was once considered the best method of opening all buboes; but in ordinary acute bubo it is not advisable, as it would overstimulate the parts—there the knife is better; but in chronic bubo, especially in that form of chronic bubo where there is much hardness, and the unhealthy appearance of the undermined integument, the *potassa fusa* is very useful, as it not only destroys the part acted on to evacuate the contents, but the neighbouring skin, having very little vitality, sloughs, and a healthy action is induced in the harder parts beyond. In all cases it is well to apply some alkaline lotion on the bubo and parts around before and after opening it, so as to prevent any risk of contamination by the venereal virus.

The after treatment of bubo is not the same in all cases, for buboes take on different actions; sometimes they prove very



troublesome, sloughing, and becoming phagedenic. The treatment of the phagedenic bubo is to apply nitric acid or some other caustic to it so as to destroy the phagedenic ulceration, and afterwards use charcoal poultices and other antiseptic remedies just as in ordinary phagedæna. This form of bubo, however, is attended with great danger to the patient, for it extends rapidly both in surface and depth, and we sometimes see the femoral artery exposed and pulsating in the sore; and if the diseased action be allowed to go on, the coats of the artery may give way and fatal hemorrhage ensue.

Another secondary condition of syphilis following after the primary sore is the

ACUTE SYPHILITIC SORE THROAT.—This can hardly be mistaken for an ordinary sore throat. The tonsils are of a dark-red colour, they rapidly become ulcerated, the edges of the ulcer are ragged, and have an angry red look, and the surface presents a dirty yellow appearance. Owing to the swelling of its edges it looks like a deep excavation. The ulcer generally occupies one or other of the tonsils, but sometimes it passes towards the uvula and pillars of the fauces. There is often a considerable amount of febrile excitement accompanying the disease, just as in ordinary tonsillitis. The local treatment consists in the application of nitrate of silver to the surface of the ulcer. The use of warm-water gargle, and subsequently chlorate of potash gargle, or the chlorine lotion or alum gargle, may be used. Occasionally when the uvula is œdematous, we require to make punctures or scarify it, as there is a risk of acute œdema glottidis supervening, and with a view to prevent the œdema extending in other directions, we should in some cases remove part of the uvula. The usual antiphlogistic remedies are to be adopted to prevent the further progress of the inflammation.

A more chronic form of the same disease is met with as a tertiary symptom, but it yields readily enough to local applications of nitrate of silver, combined with the internal use of iodide of potassium.

Along with these conditions, we have one or other of the skin affections or eruptions. In secondary syphilis these are very numerous and various, and we often have them mixed together, such as the papular and pustular forms, being both present at the same time. There are four special kinds of eruption generally met with in the secondary stage proper, as distinguished from the tertiary stage. The papular are, *lichen syphiliticus*; the pustular, *ecthyma syphiliticum*; the squamous, *psoriasis syphilitica*; and the vesicular, *eczema syphiliticum*—the first two being by far the most frequent.

The papular form of eruption consists of pimples or raised spots scattered over the whole surface of the body in groups, sometimes absolutely confluent. The pimples are not very acuminate. On the top of each is a sort of vesicle containing a milky-looking serum, which in some cases appears very like pus. This form of eruption generally occurs in clusters, sometimes over the whole surface of the body, generally beginning on the chest, arms, and face, and passing thence to the lower extremities. The pimples generally fade away in from three to four weeks, first disappearing from one part of the body and then from another, leaving the site of the eruption covered with reddish spots, which also gradually disappear.

The pustular eruption consists of pustules of various sizes, which have a raised papular form, very like the preceding, but usually somewhat larger. In some cases the pustules are confluent, and so very much like those of small-pox as to be hardly distinguishable from them. The syphilitic pustules, however, are generally much smaller than those in small-pox; and besides, in the latter disease, the pustules go through a regular course, while in the former we have various crops of pustules coming out at different times, and, as these pass off, others come out elsewhere. This symptom will generally serve as a diagnostic between the two diseases. Both the papular and pustular forms of eruption are attended with some fever, sometimes with great febrile excitement. When the pustules fade away they leave a peculiar copper-coloured spot of a larger size

than the original eruption. This copper-colour is distinctly marked in all the syphilitic eruptions. The febrile excitement is often well marked: the pulse is quick, there is sickness and vomiting, generally with headache, and sometimes with delirium. In other cases, as in lichen, there is no marked fever, though in every case there is more or less of a febrile state of the constitution.

The third form of eruption is the *Psoriasis syphilitica*. This forms red spots raised from the surface of the body, and varying in size from that of a pea to that of a sixpence. They have a sort of vesicle on the top, the base being of a bright vivid red colour, and they have rather the appearance of suppuration. The fluid exudes from below the surface, and the parts desquamate. We have the face swollen and covered over with the red spots, and a general irritation of the skin in the neighbourhood; and as the desquamation goes on the whole surface scales over. This condition was termed by the old writers the "true scaly-pox;" and it is this form of eruption, above all others, which follows upon the indurated chancre, and hence some would limit the term "true pox" to this form of disease arising from the true or hard chancre. The psoriasis syphilitica is attended with a good deal of constitutional disturbance. And in it also the syphilitic sore throat is most marked and severe, though in all cases of skin eruption it is present, to a greater or less degree. The psoriasis recurs from time to time, and in the tertiary stage it sometimes becomes persistent and is very troublesome to cure; but when it is treated actively in the secondary stage, we can generally prevent or modify its recurrence.

The fourth form of eruption is the *vesicular form*, this very often assumes a tubercular appearance. The vesicles are slightly rounded and elevated, and are filled with opaque serous fluid; the vesicle bursts and forms a dark crust, under which ulceration takes place. Sometimes the ulceration undermines the parts until it comes out from below the crust; at other times it gives rise to the serpiginous ulceration so often met with in syphilitic

diseases. The crust formed is very marked, and when removed it forms again. In tertiary syphilis it is met with in its more distinctive forms. When the ulcerated crust is removed the surface presents a peculiar excavated, rounded, or serpiginous appearance, with no tendency in the ulcer to heal, and the crust forms anew. Sometimes the crust is very prominent, and so causes great deformity. This is the *rupia crustata*. It occurs chiefly in tertiary syphilis, which is merely a more advanced stage of the disease—there being no natural division between the secondary and tertiary stages.

*Treatment of the Skin Eruptions.*—The papular and pustular forms may occur after a soft chancre. The third or scaly eruption seldom occurs after a soft chancre, but almost always after the hard. During the irritable or febrile state the treatment must be nearly the same in all cases—viz. to allay the febrile excitement before using specific remedies. In this stage the stomach is out of order, the tongue foul and furred, and the secretions are often arrested, and before giving remedies like the iodide of potassium we must first get rid of these symptoms by the use of alteratives, purgatives, various diaphoretics, such as acetate of ammonia, along with an occasional opiate, keeping the patient at rest being of course important.

When we have to deal with the papular or pustular eruptions after the febrile condition has been got rid of, the surface assumes a dark brownish appearance, and then the best remedy—especially in the papular eruption—is the iodide of potassium, which is here really beneficial; it should not be given along with any other medicine, and it must be given in doses proportioned to the age of the patient; begin with three or four grain doses twice a-day, and increase it gradually to five-grain doses, but not more. Under the use of the iodide the sore throat and the papular and pustular eruptions disappear very rapidly; the pains in the bones and joints, which are sometimes complained of also disappear and the patient is relieved from all uneasy symptoms. It is seldom, if ever, necessary—especially in the papular eruption—to have recourse to mercury, which at the

most can only be required as an alterative to use with the iodide of potassium, which by itself is usually sufficient ; but sometimes when the disease does not yield to the iodide of potass the mercury may be given, taking care of course not to push it too far. Mercury is apt to produce diseases very similar to those met with in the more advanced stages of syphilis, and hence there is always some risk in using it, and its effects in each case require to be carefully watched. When we do use the mercury, the best preparation to use is the iodide of mercury. The decoction of sarsaparilla may be given after the iodide of potassium, but I have no faith in it, though Mr. Lawrence—whose lectures on syphilis are well worth consulting—values it highly. When the eruption is beginning to fade, the use of a bath containing a little bicarbonate of soda is very beneficial ; after a time add a little sulphur, but do not make the bath too stimulating. In some cases we require to use the weak nitro-muriatic acid bath. The same acid given internally is also often of great service.

In the treatment of the scaly eruption, I would always begin with the iodide of potassium, as in some cases, when given in large doses, it effects a cure of the disease ; but at the same time it cannot be altogether trusted to, and therefore it must be combined with some alterative form of mercurial ; and we find that in this form of disease even anti-mercurialists give a little mercury, but here, as elsewhere, its effects must be carefully watched, never allowing it to produce extreme salivation, and never giving either it or the iodide of potassium during the stage of febrile excitement, but only when the desquamation is taking place.



## LECTURE XXVI.

Secondary Syphilis, continued—Condyloma and Warty Growths—Affections of the Lips and Tongue—Phymosis—Fissures and Contractions. Tertiary Syphilis—Tertiary Ulcers and Abscesses—Diseases of the Periosteum, Bone, and Cartilage—Treatment. Congenital Syphilis: its Nature, Symptoms, and Treatment.

THERE are certain other local affections besides the sore throat and the bubo which accompany the secondary stage of syphilis; they are sometimes mentioned as tertiary symptoms, but they are most severe during the secondary condition. These are—the different forms of condylomata and warty excrescences; a peculiar form of iritis; certain forms of cracks or fissures occurring in different parts of the body; affections of the lip and tongue, and a form of ulcer met with in the rectum; also syphilitic contraction of the rectum.

The *Condylomatous* is a very common form of secondary symptom. Sometimes it is considered as a primary symptom, but it is really a secondary condition, and it is not likely to produce a sore like a chancre. There are two forms of syphilitic condyloma: one, the warty condyloma, which is not unlike the ordinary gonorrhoeal wart; the other or more marked syphilitic affection—the mucous condyloma. Both are of frequent occurrence, the warty condyloma being perhaps the more frequent in the female than in the male, while the mucous condyloma is very common in both sexes. Condylomata are met with, not only on the genital organs, but also near the anus, scrotum, and groin. Very generally the tonsils and throat, sometimes the lips, are also affected. The warty condyloma sometimes assumes a villous form of growth, and then closely resembles epithelial cancer. The mucous condyloma also often occurs at the edge of the lip, and forms there a fissure, or ulcer with a hard base, which, from the constant movement of the parts, becomes very



irritable, and assumes the appearance of canceroid disease ; and hence a correct diagnosis of these condylomata is very important, and, for this reason in ulcers of the lip we should not be too hasty in operating. One guide to the diagnosis is, that true canceroid disease is not common, as a rule, in young people. The mucous condyloma is more characteristic of the pure syphilitic origin ; it has a smooth mucous surface, with a hard raised base, and secretes a fluid which, touching the neighbouring integument, seems to give rise to other condylomata. Co-existent with it there is often a condylomatous sore-throat, which is a chronic condition, and is quite different from the acute syphilitic sore throat.

The mucous condylomata may be got rid of very readily by local treatment only, such as dusting calomel over the condylomata, which will cause them to disappear without leaving any tendency to the reproduction of the disease. When the condylomata resist the calomel, they can generally be cured by applying locally a strong saturated solution of sulphate of copper, or, better still, rubbing them with the solid sulphate of copper, though this is a much more painful remedy than the calomel. But we can hasten the disappearance of the condylomata by giving internal remedies, such as the iodide of potassium, in pretty large doses, or a few doses of grey powder, taking care not to carry the latter very far. We sometimes find that patients suffering from condylomata are very weak and exhausted, and in these cases the use of mercurials is contra-indicated. Here we require to restore the general health, and trust to the local treatment ; and afterwards, when the patient becomes stronger, we may give the iodide of potassium or grey powder.

The calomel is not so efficient in the case of the warty condylomata as it is in the mucous condylomata. In the former the strong acetic acid or chromic acid, applied upon the surface, is more useful. But when they are very large and numerous, it is better to remove the warts by operation, along with part of the integument from which they arise, perhaps touching the parts,

after the removal, with a little sulphate of copper ; although there is not much fear of the cut surface taking on the diseased action.

Another condition met with, both in the primary and secondary stages of syphilis, is one which may also occur as a congenital affection—*Phymosis*. When it exists along with, or is consequent upon a chancre, it is very troublesome to deal with, though, if it be seen in the early stage, and if there be no congenital phymosis, it can generally be got rid of readily ; but in many cases the part beyond is swollen, and often there are a number of sores existing within the prepuce, and, if left to itself, the unhealthy discharges are confined, and the diseased action often destroys the prepuce, though at other times the condition may pass off without treatment.

When the phymosis is so decided as not to allow of the prepuce being drawn back, the best treatment is to introduce a director beneath the prepuce, close to the side of the frænum, and with a bistoury slit up the prepuce to its whole extent. When this is done, we see the position, extent, and number of the sores, if the condition have existed for some time ; and if there be a large sore on the prepuce, or if a number of small chancres be present, the best treatment is to circumcise the patient, by cutting off the prepuce higher up with a pair of scissors. One objection made to this plan of treatment is, that the cut surface left is apt to take on a chancreous action ; but the same objection applies to the slit made in cutting open the prepuce, which is a necessary operation, and the risk of bad results after the circumcision, is not much greater than if the prepuce had only been slit up. After removing the prepuce, we may touch the surface with nitrate of silver, to prevent the unhealthy action taking place ; but that is sometimes apt to irritate the parts. After circumcision there is usually a good deal of bleeding, and we require to tie some of the larger vessels, and then apply cold-water dressings to repress it, and afterwards treat the chancres in the usual way. If there be a chancre situated near the frænum, which does not heal readily at the first, but

goes on increasing in size, then the best thing to do is to divide the frænum, otherwise the diseased action destroys it ultimately by the ulcerative process, and the chancre may ulcerate into the urethra. After cutting the frænum the sore will heal readily. Here also we must watch against hemorrhage, not so much at the time, but from oozing afterwards, when the irritation causes the penis to become semi-erect, as it often does. Cold-water dressings, or ice, will, however, be sufficient to repress the oozing of blood.

*Fissures* or cracks as symptoms of secondary syphilis occur about the edges of the nails and between the fingers, at the edges of the lip and on the tongue, and by the side of the rectum, where they assume all the appearances of fissure of the anus, but not healing so readily under treatment. In the tongue these fissures are very common, and when of long standing they assume characters very like those of cancer. In one case of this kind every remedy had been tried, both locally and constitutionally, but without avail, and I began to consider it a case of cancer supervening upon syphilitic affection; the patient was suddenly seized one night with urgent dyspnoea for which tracheotomy was at once performed, and immediately afterwards the ulcer in the tongue began to heal rapidly; in this case all the marked appearances of cancer were present, but when once the source of irritation was removed the true nature of the disease was evident. Sometimes we may require to divide the fissured ulcer of the anus, as is done in ordinary fissure of the anus, but as a rule this is to be avoided, unless there be very great pain; it is better to apply nitric acid or nitrate of silver on the surface, and give iodide of potassium or the iodide of mercury or gray powder internally.

**TERTIARY SYPHILIS.**—It is very difficult, in fact almost impossible, to draw a line between secondary and tertiary syphilis, and say definitely when the one ceases and the other begins; we must judge in great measure from the appearance of the patient—the secondary symptoms may show themselves even before the primary sore is healed. The tertiary symptoms generally occur some considerable time after the chancre has healed,

and after it may be several attacks of the secondary condition, and the symptoms are generally most marked when the patient's health has begun to deteriorate from some other cause. So long as the patient is well nourished and taken care of, the tertiary symptoms may be altogether absent or very much modified, even though the primary and secondary conditions have been very severe ; but on the other hand the patient may have very slight secondary symptoms, perhaps none to attract attention, and yet suffer from tertiary symptoms.

In the tertiary stage pains are felt in the joints and long bones, with rheumatic pains in the head and intense headache, and occasional attacks of sore throat. Constitutional or cellular-tissue ulcers, as they are termed, occur in different parts of the body. These ulcers present the appearances already spoken of—namely, either a circumscribed exudation round a hollowed-out sore, with unhealthy-looking surface, sometimes very irritable, or showing a tendency to burrow, or they may assume the serpiginous form, the whole limb presenting the appearance of a mass of ulcers which blend into one another. In these cases we almost invariably find that the constitution is debilitated from some previous cause, either from an extremely scrofulous diathesis, or from the effects of large doses of mercury, or very generally from a combination of these, with dissipated habits or other causes of weakness. The symptoms met with in tertiary syphilis are constitutional ulcers, inflammation and pain in the bones, and the formation of granular nodes. Under the periosteum there may be a feeling of fluctuation and a raised swelling ; if an opening be made at the part a few drops of unhealthy pus escape, but a considerable amount of exudation still remains, and the part is certain to ulcerate and expose unhealthy bone below ; this condition is termed the syphilitic periostitic abscess, and it ought never to be opened if we can possibly avoid doing so.

Again, in the head there is intense rheumatic or periostitic headache. Ulcerations of the scalp take place, attended with unhealthy exudation into the scalp tissue, and the connective

tissue between it and the pericranium ; a large ulcer is formed by the union of several smaller ones, and at the bottom of it is a quantity of bare carious bone constituting what is termed corona veneris. The disease may affect the membranes of the brain and so give rise to cerebral symptoms, and ultimately prove fatal.

Besides these diseases of bone, there are also affections of the larynx met with in tertiary syphilis, such as ulceration of the larynx, which may also occur as a secondary symptom ; though in the tertiary stage it is much more severe, and generally affects the cartilages of the larynx as well as the mucous lining, producing a form of necrosis of the cartilages, similar to the cario-necrosis of the bones of the head. This condition often requires the performance of tracheotomy to obviate the risk of suffocation. Different forms of skin eruptions are also met with in the tertiary stages, such as the *Rupia crustata*, *ptyriasis*, and *psoriasis*, but they are essentially the same as in the secondary stage of the disease.

In the treatment of tertiary syphilis I trust very much to the iodide of potassium as an internal remedy. Mercury, if it can possibly be avoided, should not be given. The nutrition of the patient, however, is the most essential part of the treatment in this stage, and if there is not much irritation present, some wine or other stimulant should be given. The iodide of potassium may be exhibited in five-grain doses twice or thrice a-day, and should be continued for some time. If, by itself, it does not produce very beneficial effects, Fowler's arsenical solution may be given along with it, though the iodide and the arsenic should not be mixed together, but taken separately, so that one or other may be discontinued if necessary. Our chief object in the treatment of tertiary syphilis is to get rid of the debilitated condition which characterises it by means of proper nourishment, the use of fresh air, change of occupation, and of scene, along with tonics, such as quinine, cod-liver oil, and preparations of iron. When once the general health is re-established, very little medicine will be required to cure the syphilitic symptoms.



The subject of CONGENITAL SYPHILIS is one of great interest in many respects ; but in a course of lectures on surgery it is impossible, due regard being had to other subjects, to enter on it further than to describe its general symptoms and treatment, so that you may be able to recognise the diseased condition and adopt the proper measures for its cure when you meet with it in practice ; and this I shall do very briefly.

By congenital syphilis, we mean syphilis contracted by a child during intra-uterine life. The transmission of the disease to the fœtus may be due to either the father or mother, or both being syphilitic at the period of conception, or the mother may contract syphilis during gestation, and transmit it to the fœtus. The child is usually weak and shrivelled at birth, and continues to have a dwining appearance, and very generally it has a peculiar snuffling breathing, accompanied with discharge of offensive mucus from the nostrils, and irritation about the eyes and eyelids. Soon after birth, affections of the skin and mucous membranes begin to show themselves in the form of cracks and ulcerations or swellings at the orifices of the mucous canals. One of the most characteristic symptoms is the occurrence of mucous tubercular patches on inside of the thighs, the nates near the anus, or on the sides of the vulva in the female, or scrotum in the male. These patches are of a brown or red colour, of copper tint, slightly elevated ; occasionally they are of a dull white colour, and vary in bulk from the size of a split pea to that of a shilling. They are often very irritable, and exude a thin moisture or discharge, and are of the nature of condylomata.

The cutaneous eruptions are most usually either pustular or vesicular—ecthyma and eczema, are common ; the papular and squamous are less common. In children who have been affected by congenital syphilis, the teeth generally undergo a crumbling decay at an early period, the central incisors of the upper jaw being usually the first to give way. This degeneration affects the permanent, as well as the temporary, teeth, the former being usually short and pegged. As the patient grows up, he is subject to chronic pains in the bones and joints, and sometimes



a peculiar joint affection closely resembling white swelling ; which, however, is more amenable to appropriate treatment. If the patient be of a strumous diathesis, all the constitutional symptoms become more serious.

*Treatment.*—Looking to the dwining, weakly, and irritable state of the infant, you might think congenital syphilis a very hopeless disease for treatment, and yet I know few diseases where appropriate remedies judiciously exhibited, and combined with nutritious diet, so rapidly effect a change for the better in the state of the patient. A few doses of gray powder produce almost marvellous results. The marasmus or wasting is arrested, the child begins to take food, nutrition goes on, and the skin-affections and condylomatous patches on the nates or genitals begin to disappear under the action of the medicine ; or if they prove obstinate, dusting them with calomel, or the application of sulphate of copper, either in solid or solution, speedily effects their removal. The calomel is the preferable application as being devoid of pain, and it is very effectual ; it should be puffed upon the affected part from a small India rubber injecting-bag, so that it is applied in the form of an impalpable powder. Inunction with weak mercurial ointment has been recommended as preferable to giving grey powder or other mercurials internally, but I have found the grey powder so simple and efficacious that I have never tried any other alterative remedy. It seldom requires to be given for any length of time, and so soon as the infant begins to gain flesh and to take food, and nutrition is fairly established, little or no treatment is required, except, perhaps, local applications. Salivation is not to be looked for, indeed it is almost impossible to salivate an infant, nor is it desirable ; all that we want is a slight alterative effect of the mercury, and that is sufficiently gained by a few doses of two grains of gray powder. In regard to nourishment—the really most important part of the treatment—a healthy nurse should, if possible, be obtained, or, failing that, goat or ass milk, or cream and whey with a small proportion of sugar, given in preference to farinaceous food. As the child grows up, beef-tea, essence of beef, and cod-liver oil may be given if they agree with the

digestive organs. In very weak infants we may, from the first, require to give wine in the form of white wine whey, or even brandy and water, till nutrition is established. Sponging the body with some tepid weak alkaline wash, such as a drachm of carbonate of soda to half-a-gallon of rain water, will be found beneficial in improving the general health as well as the state of the skin, which always requires attention even after the eruptions disappear.

## LECTURE XXVII.

Wounds ; their Nature and Classification—Incised Wounds : mode of Infliction ; Appearance—The circumstances which modify or aggravate their Severity—Treatment of Incised Wounds—Arrestment of Hemorrhage—Cleanliness—Apposition of Severed Surfaces—Position of Part—Lectures—Local Application—Danger of Undue Pressure—Regimen—Opiates—Rest.

In a former lecture I alluded to the healing process, and dwelt on the distinctions between and the conditions affecting primary and secondary union. It will be useful for you to remember these particulars, now that we are about to consider the various solutions of continuity of the surface, and deeper parts of the body, which are generally recognised as wounds.

WOUNDS are classified under the following heads :—*Incised, Punctured, Lacerated, Contused, Gunshot, and Poisoned.*

We shall first consider the INCISED. This is the simplest form of wound, and includes most of those made in surgical operations. It is inflicted by a sharp cutting instrument, and the textures are divided evenly and smoothly ; there is no tearing, bruising, or twisting of the parts, and hence the incision is attended at first by smart hemorrhage, more so than most other forms of wound. This results from the vessels being cleanly divided, so that the hemorrhage proceeds until they retract within their sheaths, or until the system becomes affected by faintness from loss of blood.

If the wound has been made parallel to the axis of the limb, and to the course of the subjacent muscular fibres, there is no gaping of the edges so long as the part is kept in position ; but if the incision be transverse to the axis of the limb, or if it has divided transversely the subjacent muscular fibres, then the wound will gape, and the deep part more largely than the superficial, owing to the retraction of the divided muscular fibres. If the

muscles so divided be deeply situated, a cavity will be formed in which blood and other discharges are apt to collect, and so complicate the treatment. For example, suppose a person has received a superficial longitudinal wound along the front of the thigh, it will gape very little if the limb be kept in a straight position, because the margins of the wound keep in contact ; but if the wound be deep, and the muscular fibres transversely divided, though the edges of the wound may lie together superficially, the deep part will gape and form a cavity in which blood and discharges will accumulate.

The *Treatment* of incised wounds is very simple, the object being to promote immediate union, or union by the first intention. A certain amount of excited action is necessary to lead to exudation of plastic material for the purpose of agglutinating the edges of the wound at first ; afterwards, this material becomes organised and forms a permanent fibrous texture or cicatrix. In all cases of union, we find that there is some difference in structure between the cicatrix and the natural tissues. In fractures, the material which unites the bone becomes ossified, and resembles in a great measure the osseous texture, but still its character is somewhat different from that of the surrounding bones. So in the skin, though the cicatrix resembles very closely the skin tissue, we can always distinguish it, even when old, by a slight difference in colour, especially when the part is cold. In scurvy, we find fractures and old cicatrices which had healed long before, giving way, showing that there is a difference of vitality between the new material and the old. In muscles the new material never becomes identical with the existing muscular texture, but forms a sort of break in the continuity of the muscular fibres, though the muscle is as useful as before, from the uniting medium joining the other fibres together. To favour the process of union by the first intention, which is desirable in incised wounds, there should be as little separation of parts as possible, so that there may be no deformity, and that the usefulness of the part be not destroyed. Hence all foreign substances between the cut

surfaces should be removed, and the edges kept in close contact and at perfect rest. Excited action must be controlled within moderate limits, though a certain amount of it is salutary, because by it the plastic lymph is thrown out more abundantly.

Hemorrhage, whether venous or arterial, must be arrested; and this is the first thing which the surgeon has to attend to. If a small artery be partially cut, blood of a bright red colour spurts out in a jet; but if the vessel be completely cut across, the ends contract and retract within the cellular tissue, and the bleeding ceases. At the extremity or angle of a wound, where the vessel may be merely cut into, and only partly divided, the bleeding will, in some instances, continue or take place from time to time, and so prove serious. In such cases, the best plan is to extend the incision so as to divide the vessel completely. This enables us to see the divided ends which before were concealed; and, if necessary, a ligature can be applied, though, generally, this will not be necessary, as the bleeding will probably cease very soon. So long as the vessel is only partially divided, it cannot retract within its sheath; but when cut through, the retraction takes place, and the hemorrhage is arrested naturally. The venous bleeding is generally easily arrested, if we attend to position. A good deal of it—especially after operations—depends on unequal pressure from bandaging or position, by removing which the oozing of blood will cease. Even when a large vein has been wounded, a little compression with a piece of lint, attention to position, and exposure of the wound to cold, will generally prove quite sufficient to arrest the bleeding; but if not, we may tie the vein, or employ acupressure. Generally, there is no necessity for tying a vein, but the danger of doing it is not so great as is generally supposed—especially after amputation—as I have repeatedly proved in my own practice.\*

After the bleeding has been arrested, all clots and foreign substances must be removed from the wound. It might be

\* Natural and artificial hemostatics will be discussed in the lectures on injuries and diseases of the vascular system.

supposed that an incised wound was not likely to have any foreign body in it. Nor has it when made by the surgeon. But, in other cases, the wound may be filled with dust and dirt, from the patient falling and struggling on the ground after receiving the wound. And in such cases this must all be removed, either by a sponge or by the point of the finger, and afterwards by a stream of tepid water poured from a height. The next thing to be attended to is position, and bringing the parts into accurate contact. Here the direction of the wound must be considered. If the muscular fibres be deeply divided, it is as well to allow the wound to remain open from six to eight hours ; or if we employ sutures, we should leave them loose, so that they can be easily tied afterwards. At all events, we leave the wound so far open that the blood and serous discharge may escape ; and after a few hours we may wash out any clots, and bring the edges accurately together, and so secure them. This is to be done partly by sutures or plaster, partly by attention to position. If the wound be parallel to the axis of the limb, we simply place the limb in an easy and natural position, and put in a few sutures about an inch or so apart. The edges will unite readily enough if we leave them uncovered. If the wound be transverse to the axis of the limb, it is as well to relax the muscular fibres, so as to leave as small an interval between them as possible. We must also prevent any accumulation of blood or discharge into the cavity of a deep wound, by means of properly applied compresses and bandaging, leaving the wound partially open, and attending to position, so as to favour the discharge.

Various forms of suture are employed in keeping the edges of incised wounds together. The ordinary *Interrupted suture* is the most common. If the thread or wire causes any irritation, it should be at once removed ; and in doing so, it is better to remove the lateral sutures, leaving the central one in, than to remove the central ones. If the irritation caused by the sutures be very great, they should all be removed. The *Harelip*, or *convoluted suture*, is also sometimes employed. The needles should be passed deeply through the parts, and introduced at least a



quarter of an inch from each edge. Slightly waxed thread is the best substance to use with the needles, and as little pressure as possible should be applied. The needles are withdrawn about the fourth day, so as to prevent any irritation being caused by them, though, in some cases, they may be left in much longer. When we want to apply pressure on the deep as well as on the superficial part of the wound, the *Quilled suture* is employed. It is often used in cases of ruptured perineum, where, by passing needles deeply, we keep the deep parts together, and by one or two interrupted sutures the edges are brought into close contact, for when the two pieces of quill or wax-bougie are placed in position, and the threads tied, the effect is slightly to evert the skin margins of the wound. When the injury is superficial, sutures are not required at all—strips of plaster are sufficient. It is only when there is any great depth or extent of wound, that they are necessary.

As to local applications to incised wounds, many substances formerly were used to favour adhesion and prevent unhealthy action, such as Friar's balsam (the compound tincture of benzoin) and Arquebuzade, an aromatic spirit of rosemary. The former of these constituted a sort of varnish, and acted as a foreign body. The latter, which coagulated the albumen and glazed over the wound, answered better. Now-a-days all such preparations are given up, as being irritating and exciting, and so promoting too much action ; hence, the best treatment which can be adopted is to leave the wound alone. In large wounds after surgical operations, where there is a risk of suppuration occurring, and where we cannot expect the adhesive process to take place throughout the whole surface of the wound, or where there still remains on a flap part of the pyogenic membrane of an abscess—the tincture of iodine painted over the surface is very beneficial. Under the iodine the suppuration is arrested or diminished, and a more healthy action is excited. Another application I at one time used was carbolic acid in methylated spirit ; but I have found the iodine to answer better. After the removal of malignant growths, a weak solution of chloride

of zinc (1 part to 30) may be used with advantage. But in the majority of incised wounds, no such local applications are required. For the first six or eight hours, cold dressings, as lint dipped in iced water, may be used; but this must not be applied too long, as it may do harm. Afterwards the wound is left uncovered, a piece of lint is laid lightly over the surface. The lint, during warm weather, may be sprinkled over with strong spirit of rosemary, or chlorinated wash, or carbolic acid, so as to prevent putrescence.

In wounds of joints, I generally apply ice, in gutta percha bags, over the part, so as to keep the temperature very low. When this plan is adopted, the cold must be kept up continuously, or the reaction will do more harm than the irregular application of cold will do good.

In former days, surgeons used to apply pressure to a wound by plates of metal or wood, so as to keep the parts in close contact and prevent all movement. This was trying to force nature, and often produced much interruption to the circulation, brought on inflammatory action, and sometimes led to sloughing in a flap instead of union. Beyond inserting sutures, and occasionally applying gentle support by means of a bandage, the less meddling the better; any attempt to force the parts into contact will assuredly do harm. The regimen should be carefully attended to—the diet should be light and nourishing. After operations, or after severe wounds, an opiate should be given immediately to allay pain and shock, and procure rest. When the pulse rises high, antimony may be given along with the opium, so as to diminish the force and frequency of the heart's action, determine slightly towards the skin, and allay fever. In cases where antimony cannot be given, from its causing great nausea, aconite is very useful as a sedative. It may be given in half-drop doses of Fleming's tincture every three or four hours. When the pulse becomes moderate, the aconite should be discontinued. After a few days, a more generous diet should be given, especially after severe wounds or operations. A great error is committed by continuing a low

diet too long. The stomach gets out of order, the patient becomes irritable, nutrition is not kept up, and the wound does not heal, but suppurates. A small amount of solid animal food ought to be given very soon after an operation ; it is less likely to excite irritation, and more likely to be easily digested than a larger quantity of slops.

The sutures should be removed according to circumstances—some of them, perhaps, about the fourth day. When they are removed, slips of plaster should be applied so as to give some support to the parts, though not exactly at the points where the sutures were, as there may be a slight tendency to suppuration at these points, and the plaster would prevent the matter from escaping. The slips of plaster should be short, so as not to cause any traction, but merely to support the margins of the wound in apposition.

## LECTURE XXVIII.

Punctured Wounds : their characteristics—The Special Dangers attending them such as—Erysipelatous Inflammation—Softening of the Muscles and Pyæmia—Treatment of Punctured Wounds—By rest—Application of Cold and Antiphlogistic Regimen—By Dilatation and Conversion into Incised Wounds—Contused and Lacerated Wounds ; definition and mode of infliction—Nature and treatment of Contusions—Lacerated Contused Wounds : how produced—Attended with great Destruction of Textures—Examples—Risks of Tetanus and Secondary Hemorrhage.

PUNCTURED WOUNDS are inflicted by thrusts, the point of the weapon penetrating, and the blade or body following, and separating the tissues like a wedge, rather than like a cutting instrument. The purest form of punctured wound is that produced when the point of the weapon is sharp, and the blade rounded or blunt. Examples of punctured wounds are those made by the trocar in surgery, or by weapons such as the bayonet, rapier, or pike, where there is little or no cutting of the textures.

A wound inflicted by such weapons has the following characteristics :—Its depth is greater than its superficial extent. As the parts have been thrust aside rather than evenly divided, there is more or less contusion and ecchymosis, and when the weapon is withdrawn, the elastic skin and dense fascial textures close or contract so as to leave a very small orifice compared with the size of the weapon, or with the depth of the wound. If the muscular fibres have been divided, a large deep wound is left, because the muscular fibres retract and gape, while the skin and fascial textures contract.

This form of wound will be modified according to the form of the weapon ; it varies according as the breadth of the instrument increases from the point, or, as the edge is sharp and the

WOUNDS.



Fig 1.

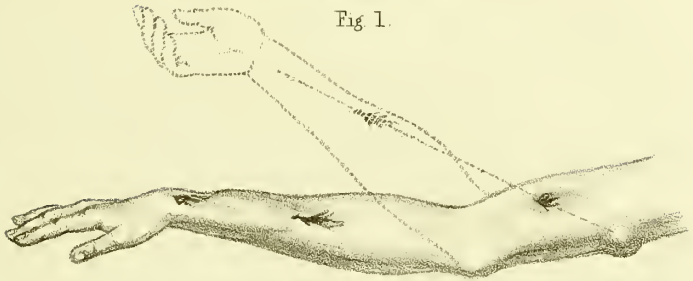


Fig 2



Fig 3.



Fig 4.





blade thin or blunt. The most typical example of a punctured wound is that caused by a rapier or small sword, where the edges become blunted as they go upwards from the point. In a wound inflicted by the thrust of a broad-sword, or ordinary military regulation-sword, where the blade is thin, and the edge sharp some distance from the point, the weapon has more breadth and extent of cutting edge than in the former case ; and here, moreover, the external orifice does not close so much.

The special dangers attending punctured wounds are considerable. First, there is the confinement of blood and other fluids in the deeper part of the wound, caused by the contraction of the external orifice, and its small size compared with that underneath. This may lead to serious consequences, especially if the wound be in an important part. Secondly, a peculiar diffuse or erysipelatous form of inflammation, followed by great tension, is very apt to supervene, especially when fasciæ and muscles are implicated. Another point, not often alluded to in surgical works, is the softening of the punctured muscles. The muscles become inflamed and softened, and in such cases symptoms of pyæmia are apt to set in. The patient, perhaps, goes on very well for ten or fifteen days, then rigors come on, the limb becomes tense and glazed but not red, the pulse gets very quick, irritative fever is set up, and death follows, attended with all the symptoms of pyæmia. On examining the muscles in such cases, they are found to be softened and paler than usual ; sometimes, however, they are of a dark brown colour and broken down in texture. This softening of the muscles takes place very often in simple flesh wounds, either inflicted by a stab, or even in the slighter forms of gunshot wounds. The danger of hemorrhage—either venous or arterial—in punctured wounds, within the textures, or into cavities, is great ; as when the wound has penetrated any cavity, such as the abdomen, where the blood cannot pass readily outwards ; or when important organs like the lungs are injured, where the internal hemorrhage would be very serious. There is greater danger of interstitial hemorrhage taking place in punctured than in any other

form of wound, because the deeper muscular textures retract, and leave a space where bleeding may go on, while the superficial skin and fascial textures contract so that the blood cannot escape, and at last the whole textures become infiltrated with blood, and so lead to very serious consequences, independently of the mere loss of blood. This is shown by the ecchymosis which takes place afterwards. We must, therefore, in all wounds of this kind, look to the appearance of the patient, the state of the pulse, and the colour of the skin, as these will give indications of any internal hemorrhage taking place. The principal dangers, then, in punctured wounds are:—1. Confinement of blood or other discharges in the deep part of the wound, owing to the contraction of the external orifice. 2. Inflammation, especially of the fascial textures, followed by effusion under the fascia, and a peculiar form of erysipelatous inflammation supervening. 3. Softening of the muscular textures, followed by irritative fever and pyæmia. 4. Hemorrhage either by simple loss of blood, as from internal hemorrhage, or by causing infiltration of blood into the textures leading to unhealthy suppuration.

The *Treatment* of punctured wounds used to be, at once to convert them into incised wounds, and, accordingly, all such wounds were freely dilated as soon as possible. The principle was good, but it was carried to an absurd extent. Thus, in punctured wounds of cavities, counter-openings were made, and even setons introduced through the cavity. As regards the oozing of blood, or internal hemorrhage, this must be looked to very carefully, and must be met according to the special organ wounded. With reference to the principle of dilating these wounds at first, it is quite true that dilatation is a proper method of meeting some of the special risks in punctured wounds; but does this class of wounds always require such severe treatment? The punctured wounds inflicted by a trocar are not necessarily followed by any bad effects, and in many cases of punctured wounds we may avoid the necessity of dilatation, by having recourse to simpler remedies, such as keeping the part at rest,

applying cold by ice-bags to the part from the first, and a moderate amount of compression, by a many-tailed bandage, so as to keep the parts in contact. We may thus prevent any bad consequences from taking place, and arrest the effusion of blood very much, so that little of it escapes into the cavity of the wound, and there is also less tendency to the accumulation of discharges.

If this treatment be adopted, and the patient kept on antiphlogistic regimen, with opiates to procure rest, a punctured wound will often heal as kindly as an incised one. It is not therefore necessary to dilate every punctured wound at first, but if any tension comes on, or pain with erysipelatous redness around the part, then we must dilate, and that freely; but only after using prophylactic means to favour union by the first intention. The skin and fascial textures are to be divided freely and to the same extent. Then divide the *fascia* transversely as well as longitudinally, so as to make a crucial incision in it; this will relieve all tension. So also partially-divided muscular fibres require to be divided thoroughly and completely, not merely by an incision parallel to the fibres, but by a transverse one also, so as to give free vent to any discharges from the deeper part of the wound. But to dilate thus freely in every case would be very severe treatment, and it is only in certain cases that it is necessary, though, until very recently, it was the recognised practice of French military surgeons to dilate all punctured wounds at first. There is only one case in which we should have recourse to dilatation at first, and common sense would show the necessity for it—namely, when we see symptoms of interstitial hemorrhage coming on, and the limb becoming rapidly swollen, then the wound should be freely dilated, so that the bleeding vessel may be secured. In all cases of punctured wounds, opium is useful, especially when they have been dilated, to allay the pain and irritation. The patient should be kept at rest, and have antiphlogistic diet; febrifuge medicines, such as antimony or aconite, should be given, to meet the febrile excitement. After a time, especially when there is much suppuration from a dilated wound, the diet must be more nourishing. The ordinary stimulating lotions may then be applied

to the wound, such as solutions of chloride of soda, sulphate of zinc, or sulphate of copper, and a many-tailed bandage should be applied, so as to give some degree of compression and support to the parts.

CONTUSED AND LACERATED WOUNDS.—All lacerated wounds are more or less contused, though some only to a very small extent. By a *contusion* is meant an injury inflicted by some blunt or obtuse weapon, without any breach of the integument. There may be merely rupture of some small bloodvessel, which pours out its blood into the cellular tissue, producing slight ecchymosis; or the force may be so great as to give rise to complete destruction of the deeper-seated soft textures, whilst the elastic skin resists the action, and even retains its vitality for some time afterwards; for example, a spent cannon-ball or the buffers of a railway waggon may strike a limb so as to reduce it to a pulp. The great vessels are torn and injured, and the limb all but dead, while there is no division of the skin. This is a bruise; so is a black eye; but they are very different degrees of the same injury. Contusion may be a very slight or a very serious complication. In all cases of bruise there is more or less ecchymosis, depending on the blood passing into the loose cellular tissue. When the deeper-seated parts have been very much contused, the ecchymosis does not appear for some days after the injury has been received; thus, in fracture of the fibula, caused by a twist, there is, at first, pain and slight swelling of the limb, but no discoloration. The fracture is put up, and when the apparatus is removed, the skin is found to be mottled, and of a purplish and yellow colour. This arises simply from the discoloration coming towards the surface from the bruised parts underneath. It cannot show at first, as it is deep-seated.

It is important, in medical jurisprudence, to distinguish between a post-mortem injury and one inflicted during life. If a dead body be bruised with great force, can there be ecchymosis? It is quite possible that, from the rupture of some of the larger veins shortly after death, a little semi-fluid blood may be effused; but we do not have the incorporation of the blood with

the cellular tissue, as we have in ecchymosis caused during life. The blood effused after death may discolour the parts, but it does not become incorporated with them, and we can wash or scrape it off, which cannot be done in the other case, owing to the complete incorporation which exists between it and the cellular tissue.

The treatment of bruises, when slight, consists in the application of warm lotions, or opiate applications, or cold water continuously applied; but if the bruise be severe, cold may be dangerous to the vitality of the part. In the slighter bruises, when we wish to prevent the discoloration, the application of cold or evaporating lotions of acetate of lead, muriate of ammonia, or vinegar, to the surface is useful. A very popular remedy, but one which can never be beneficial, particularly in bruises connected with fracture, is the application of leeches to get rid of the bruised blood; but, as has been already mentioned, the effused blood becomes incorporated with the cellular tissue, and cannot therefore be drawn off by the leeches. In fractures attended with bruising, the leeches not only do no good, but do positive harm; they prevent the fracture from being put up at once, and the bites often create irritation. The blood, which the leeches do suck, is healthy blood, which we do not want to get rid of. When inflammatory action sets in after a contusion, then the leeches may be of use, but not otherwise.

Where we have a large effusion of blood, as from rupture of a large vein, we are likely to do much harm by making incisions into the part at first, because the blood is apt to decompose and give rise to unhealthy suppuration, and thus occasion great difficulty in healing the wound. We rather try to get rid of it by using evaporating lotions to promote absorption and to prevent further extravasation from taking place. In this way we often find large quantities of extravasated blood disappearing, without the necessity of making any incisions. But, if after eight or ten days, there occur rigors and feverishness, followed by redness, tension, pain, and fluctuation in the part, then an incision should be made, because suppuration has probably



commenced from the decomposition of the extravasated blood, which should therefore be got rid of at once. After making the incision, the cavity should be washed out with Condyl's fluid or carbolic acid lotion, and a poultice applied. But the incision should not be made at first, especially when the bruise is on the scalp, as it is apt to prove very troublesome.

The *Lacerated* contused wound is one inflicted by some instrument or machinery which tears rather than cuts—where the parts are divided, but the edges are ragged and torn, and the textures only partially divided here and there and not equally, the least resisting textures yielding more readily than the more resisting. Thus, the muscles and vessels may be divided and torn by a force which the nerves and tendons resist, or by which they are merely partially torn and dragged out. The force may be so great as to make almost an incision from its dividing the textures so evenly; but the parts are not really divided so cleanly as they seem. In other cases, the force may be applied in such a way as to tear out textures without dividing them completely. There is always more or less ecchymosis surrounding the edges of the wound, with more or less twisting and tearing of the textures, and therefore there is great risk of sloughing taking place, and scarcely any chance of union by the first intention. In the simpler forms of lacerated wounds we may have a wound closely approaching to the simple incised wound—as, when it is made with a very fine saw moved with great force, the wound is practically an incised one. In other cases, the machinery inflicting the wound is of a tearing nature, and then the textures are much torn and not evenly divided. Sometimes heat is added to this, so that there is scorching as well as bruising. An example of this is seen in accidents caused by the heated cylinders used in paper-mills for smoothing the paper. The wounds resulting from these are much lacerated and bruised, and the parts are also more or less burned. Good examples of lacerated wounds are those caused by a machine used in paper-mills for tearing up the rags, and which is called



by the workmen a "devil." In these wounds, the tearing or mincing of parts is very great.

In lacerated wounds there are the risks of tetanus and irritative fever, and there is no chance of union by the first intention. They are more or less complicated, and we cannot therefore expect them to unite well, though, in those lacerated wounds made forcibly by a fine saw, there may be a chance of union by the first intention, owing to the comparatively even way in which the parts have been divided. The nerve filaments are torn partially or completely, but not evenly divided, and therefore there is a greater chance of inflammation and irritation succeeding. The tendinous and fascial textures too, from being torn are more apt to slough; their vitality—never very great—is injured by the nature of the wound, and considerable sloughing follows. The primary hemorrhage in lacerated wounds may be trifling, or it may be very great. In a lacerated wound caused by twisting of the part, or where there is much contusion, the vessels are not likely to bleed much at the time, the internal coats of the vessels being turned in upon themselves, and by this torsion a mechanical barrier is formed to the flow of blood. We often see large vessels pulsating in lacerated wounds without any blood flowing from them, and this is due to the amount and kind of the force causing the injury. But this obstruction of the vessels at the time is not favourable to the hemostatic changes taking place: the coats of the vessels are injured, and there is a risk of secondary hemorrhage occurring in a few days, from the sloughing which takes place consequent on the destruction of the vitality of the vascular coats. Primary hemorrhage occurs either when the parts are so far evenly divided as with a saw, or when a vessel has been injured at a point higher up than the main injury, and then profuse bleeding may occur at the time; but in all cases, even though the primary hemorrhage is not great, there is a risk of secondary hemorrhage taking place from the sloughing which necessarily follows on the injury.

## LECTURE XXIX.

Treatment of Lacerated Wounds—Heat and Moisture—Poultices—Fomentations—The Tepid Bath—Question of Amputation—Poisoned Wounds : from Dissection ; from Dead Animal Matter—The Malignant Pustule of Butchers—From Rabid Animals—From the Bites of Insects and Snakes. "

IN my present lecture I proceed to point out to you the *Treatment* of lacerated wounds.

From the nature of the injury we can very seldom expect these wounds to heal by the first intention. There are certain dangers attending them, such as sloughing, suppuration, and secondary hemorrhage, all of which are unfavourable to this result. There is also the risk of tetanus supervening in consequence of the torn state of the nerves. These are apt to inflame and give rise to irritation along their course, and so to affect the nervous centres. There is always, in large lacerated wounds, a certainty of partial sloughing at least, and great suppuration from the injured textures, and a long time must therefore elapse before such wounds can heal. In a lacerated wound, say of the hand, which does not necessitate amputation, the best plan of treatment is to apply heat and moisture, either by placing the part in soft poultices when the injury is slight, or by dressing it frequently with lint soaked in warm water, either simple or slightly medicated with Condyl's fluid. We thus endeavour to allay irritation and favour the suppurative process taking place in its healthiest form. Anodynes are given to procure rest, and antimony or aconite to allay the feverish state of the constitution.

There is another method of applying heat and moisture to the part, which, in severe cases, is very beneficial. It consists in placing the limb in a tepid bath by means of a suit-

able trough. The limb floats partly in the water, and is partly suspended by slips of bandage, so as to prevent any pressure on it. The heat and moisture can by these means be continuously kept up, without disturbing the patient. The bath is fitted with a tap, by which the soiled water is allowed to run off, while fresh water is occasionally added. On the Continent, especially in Holland and Germany, this is done by having tepid water constantly trickling into the bath, an equal quantity of cold being allowed to escape. A little of Condyl's fluid may sometimes be added to the water with advantage, not only on account of its antiseptic properties, but because the alteration of colour which takes place serves as a good indication of the frequency with which the water should be changed. After a little time, the part gets a sodden appearance, but the irritation is much lessened, and the suppuration goes on more favourably, and with less irritative fever than usual. I have found this plan attended with great success in the treatment of severe lacerated wounds and in compound fractures of the fore-arm and hand. In some cases this treatment cannot be adopted, and in some it is not necessary; in these we substitute warm water lint, covered with gutta serena or fomentation cloths, as the best methods of applying heat and moisture. In lacerated wounds of small joints, such as those of the thumb and fingers, the constant application of cold is found very useful, but this must be done with care, as the cold may further weaken or even destroy the already impaired vitality of the part. It is only in lacerated wounds where the injured joint forms the most important part, and the laceration is the least feature of the injury, that the use of cold water or ice-bags is advisable. The application of heat and moisture is safer and better when the injury is a simple laceration, though where a small joint is implicated, cold may be applied instead. If we see any fascial texture partially torn, it is best to clip it away at once, as it is sure to slough afterwards. Partially divided filaments of nerves should be completely divided, and the ends of the larger torn nerves should be cut across, taking away, of course, only the torn end of the nerve. These, if left

might serve as a source of irritation and lead to tetanus. But it is too late to do this after a few days, because by that time the mischief has been propagated to the nervous centres, and is then travelling thence to the circumference.

As regards the after treatment of lacerated wounds, when the suppuration has been established and the parts have begun to granulate, the treatment is just the same as in any granulating sore. Contraction of the parts is favoured by giving a moderate amount of support to the integument by a many-tailed bandage of lint, which not only gives support but also serves as a means for local applications. The ordinary stimulating lotions, such as those containing chloride of soda, are to be used, but weak at first; afterwards, those of a more astringent and stimulating kind, such as the sulphate of zinc lotion, should be employed.

Another question arising in cases of lacerated wounds is that of amputation. If the textures be very much torn, and the great vessels much injured, or a joint opened; if, in fact, there be such a destruction of parts that we cannot save the whole limb, then we must amputate, but still try to save as much of it as possible. But do not try to save too much, or you will lose by it: the contraction during the healing of the wound will be so great as to leave a useless stump. This is most to be attended to in the hand; where sometimes—by trying to save the whole, or by removing only one or two fingers—the remaining portion is left quite useless, from the contraction of the skin and other textures. By taking off more fingers, more skin is left to cover over the wound, and a much more useful result is obtained. Does mere loss of skin or fascial texture require amputation? This injury is most commonly seen in the hand and foot, where we sometimes have the whole skin stripped off and hanging like an inverted glove from the points of the fingers or toes. If the skin be lost on both aspects of the hand and wrist, we cannot expect the skin from the fore-arm to cover the whole hand without great contraction taking place, and here therefore we must amputate, simply on account of the loss of skin—even though the great vessels and nerves may be entire: besides,

the risk to the patient's life in trying to save the limb is much greater than after amputation. Still, in many cases, nature performs some wonderful cures : occasionally the skin borrowed from above may cover over a large surface without any great contraction. In one case, I found the whole integuments of the penis and scrotum torn off by the bite of a horse, and left hanging loosely by a mere shred. The skin was drawn back into position, and an attempt made to save it ; but very soon it sloughed, and the whole penis and the testicles were left bare : yet this wound healed perfectly, so much so that little or no trace of the injury was left. In the hand, however, there is very little chance of the skin healing over the denuded parts without great permanent contraction. In other respects, the general question of amputation must be decided according to the amount of destruction of parts, and the state of the great vessels and nerves.

The next division of this subject includes the various kinds of POISONED WOUNDS.—The severer forms of this class of wounds are not often met with in this country, though the more trifling ones are common enough. These vary in character, according to the nature of the poison. They may arise from decomposing animal matter, and such are dissection wounds, and the malignant pustule met with occasionally in butchers, which arises from their working constantly amongst dead animal matter.

Wounds from punctures inflicted in the dissecting-room are not uncommon ; but, at the same time, are seldom troublesome, unless some peculiar poison has existed in the dead body, such as that of glanders, or unless the patient's health has not been good. There is almost always something also in the state of the constitution of the recipient, which causes a simple dissection wound to take on an unhealthy action.

The best thing to do with a dissection wound is to suck the part well at the time, or enlarge the puncture or incision, so as to let it bleed more freely, and then wash it with warm water, and perhaps take a little opening medicine. If we find the wound getting irritable, red, and



painful at night, so as to cause want of sleep, and if the patient feels out of sorts, then the wound should be enlarged a little, and should be touched with nitrate of silver, which, though a painful remedy, destroys the morbid irritability, and then the local and constitutional disturbance ceases. A little saline medicine, or a chalybeate, may also be taken internally. But, as before mentioned, it is only when the health is not good that ordinary dissection wounds give any trouble. Punctures received in post-mortem examinations are very different—especially in puerperal cases—when, even though the person be in good health, much constitutional disturbance follows on the wound. There is rigor or chilliness, and a feeling of pain extending up the arm; red lines are seen running upwards along the course of the veins. These are the inflamed absorbents, and ultimately the venous system becomes affected: the glands in the axilla become tender and sometimes enlarged, and there is pain extending up to the shoulder, and, in the more severe cases, the rigors are repeated, with headache, and a tendency to delirium. There is sleeplessness at night, arrested secretions, and other symptoms of irritative fever, with a peculiar feeling of depression, præcordial uneasiness, and a desire to yawn and sigh. In these cases the patient should be at once put to bed and heat applied to prevent rigors; the bowels should be cleared out by an active purgative, and an opiate given to allay the irritability, and anodyne fomentations to the wound and along the arm. If the wound be at all tense or irritable, it should be at once freely enlarged, and the nitrate of silver applied to destroy its morbid irritability: then apply poultices, and, if possible, place the limb in a tepid bath as recommended for lacerated wounds. The use of aconite, to allay the irritability of the pulse, is not so safe in this as in other forms of wounds; because in such dissection wounds there is a peculiar risk of sudden and sometimes fatal syncope. If the aconite is given, its effects should be watched very carefully. After anodynes and local antiphlogistic treatment, we require to use stimulants and nourishing diet. The sesqui-carbonate of ammonia is useful in this class of wounds.



These wounds require much care, not only in the earlier stages, but also in the after treatment.

The malignant pustule of butchers is very troublesome, and even dangerous ; but it gives rise to more localised symptoms. The pustule is first of a dark-brown colour and spreading : it is often attended with symptoms of typhoid fever. The pustule must be destroyed by a caustic, and then fomentations applied. The constitutional symptoms must be met, like ordinary typhoid symptoms, by active stimulation, and attention to the state of the bowels and skin.

Another form of poisoned wound met with is that resulting from the bite of a rabid animal, producing what is called Hydrophobia. The wound may be inflicted some time before the symptoms of hydrophobia appear ; though the length of time that may elapse between the two is stated very differently, and is still an undecided question. The late Professor Dick of the Edinburgh Veterinary College, held that there was no such disease as hydrophobia, and that, in all the cases he had seen, the symptoms were the result of excessive fear and apprehension, giving rise to extreme *hysteria*, and indirectly leading to fatal consequences. But most surgeons recognise it as a distinct disease, which, unfortunately, proves fatal in almost every case.

The wound caused by the bite may heal kindly, and give rise to no troublesome symptoms ; but some weeks afterwards, the cicatrix is seen to be red and feels irritable, with pain extending up the limb, and a peculiar feeling of depression. There is headache and intolérance of light, but there is no dread of the sight of water at first, though, when the patient tries to drink, it produces a tremor all over the body. There seems to be a sort of choking or contraction in the throat : but it is not merely swallowing that causes this, because a draught of cold air reaching the patient will produce the same tremor. These symptoms proceed until they become almost identical with tetanic convulsions. The saliva flows copiously from the mouth. Another symptom is a peculiar irritation of the diaphragm and pharynx ; the latter is evidently excited, and, on examination

after death, is found to be dry, red, and sub-acutely inflamed, and the mucous membrane has a glazed appearance. The patient has a constant desire to drink, though, at the same time, he is unable to swallow any fluid. He coughs with a peculiar dry, husky cough, which is not unlike a bark, and this gave rise to the notion that the patient barked like the dog which had bitten him. This cough is produced by the irritation of the larynx and pharynx. Afterwards, fever supervenes ; the pulse becomes quick, and delirium sets in ; the patient is very restless, can swallow nothing, and dies from exhaustion and irritation.

The only *Treatment* of hydrophobia is prophylactic. If there be any doubt whether the animal that inflicted the bite is rabid, then it is best to apply the actual cautery to the wound, however slight it may be, and afterwards wash it and the surrounding skin with some alkaline lotion, such as diluted liquor potassæ, or a solution of pearl-ash ; or, when these are not at hand, a strong solution of soap and water, so as to get rid of all the poison. Cutting out the bitten part is not so good, as we cannot be sure of removing all the poisoned matter, some of which may still exist on the edges ; and, besides, we cannot always cut out the wound when it is deep, whereas we can always cauterise the surface which has been in contact with the poison. As regards the after treatment, opiates and various other remedies have been tried, and occasionally a cure is reported, but none of the remedies yet tried can be trusted to ; the only remedy being the application of the actual cautery at the first.

Should the dog or other animal which inflicted the bite be destroyed? Not unless it is certainly rabid, and then it should be killed at once ; but if this is doubtful, it should be kept apart, under surveillance, so that, if it show no further symptoms of madness, we can assure the patient that there is no danger of hydrophobia coming on.

Poisoned wounds from bites of insects and snakes.—These vary in intensity—from the bite of a scorpion or centipede to that inflicted by the cobra. In the former, there is not necessarily any great risk to the patient, unless his constitution be delicate.

All the symptoms generally disappear under mild treatment, such as warm fomentations, anodynes, such as Battley's solution of opium, or a drop of medicinal hydrocyanic acid in water, applied locally after suction of the wound, or some slight internal stimulus ; but if the earlier symptoms have been neglected in a person of weak constitution, fatal results may follow. On the other hand, in a bite from a very venomous serpent—as the cobra—the treatment must be immediate and energetic, as the poison runs its course very rapidly, and soon proves fatal if efficient treatment be not adopted. There is chilliness and tremor, the pulse becomes low and intermittent, there is a tendency to collapse, and death may occur within a few hours ; hence the necessity for active treatment. The poison must be destroyed at once, to prevent it from getting into the system : the limb should be tied tightly above the bite, and the wound should be sucked, or a cupping-glass may be applied instead. There is no danger whatever in sucking a poisoned wound from snake-bite, provided there be no abrasion of the mucous membrane of the mouth or lips ; but a wine-glass, exhausted of air by a bit of burning paper, makes efficient suction without risk. Then the actual or potential cauterly should be applied freely, and some strong alkaline solution to wash the parts, so as to remove all the poison. The constitutional remedies must be very powerful. Diffusible stimulants are to be given ; and perhaps the best is a preparation of ammonia, called “Eau de Luce,” which may be given in doses of a teaspoonful, and at frequent intervals, along with brandy or other common stimulants to sustain the circulation, and prevent the direct sedative effect of the poison upon the heart.

When the wound is on the trunk, or when the limb has been bitten high up, after trying to arrest the circulation, the cupping-glass should be applied, so as to remove the poison by suction, and then the cauterly applied, and diffusable stimulants promptly exhibited. Afterwards, opiates may be given to procure rest and allay irritation. If the patient escapes the first dangers, he very soon recovers, though sometimes secondary irritative fever follows and proves serious.

## LECTURE XXX.

Gunshot Wounds : Their Special Characteristics—Circumstances which regulate the Extent of Destruction attending them—Their Frequent Deviations from a Straight Course—Wounds inflicted by Small Shot : by Wadding—Superficial Injuries.

NEXT in the catalogue of solutions of continuity comes the group of injuries which is embraced in the class of GUNSHOT WOUNDS. Under this head I shall discuss injuries inflicted by the discharge or bursting of fire-arms, or by the explosion of gunpowder. They differ rather in degree than in kind from other wounds, and are generally complicated by the lodgment of balls, or fragments of other foreign bodies.

The wound inflicted in the soft parts in some degree resembles a punctured wound, inasmuch as the superficial or external opening is less extensive than the deeper portions. The parts surrounding its course are not so much cut as contused, twisted, and torn ; but all the peculiar unfavourable conditions attending punctured wounds are not only present, but much magnified. For the degree of force with which the bullet is projected is such as to sever the textures with far greater violence, and to impair their vitality to a much greater extent. So that, whilst in punctured wounds there may be a fair chance of union by the first intention, in gunshot wounds we can hardly expect any such result ; for though there are a few exceptional cases on record of these injuries healing by the first intention, yet such a result cannot be looked for as a rule.

A bullet wound may be recognised by the following characteristics :—The aperture of entrance is small, rounded, and depressed. It is less in diameter than the bullet which inflicted it, or the muzzle of the gun or pistol from which it was discharged. The edges are depressed and forced in, and, if the

ball has travelled any distance, they are not at all blackened ; a considerable extent of ecchymosis, however, may surround the part. The aperture of exit has a different appearance ; the edges are everted by the ball passing out ; they are somewhat ragged and torn ; and the opening is larger than the aperture of entrance, though not always larger than the bullet. The aperture of exit is more variable than that of entrance, and in a few instances has been found smaller, but this is difficult to account for. It may have occurred from the irregular shape of the missile, such as a slug.

If we look at the track of a bullet-wound, we see that the skin has been thrust in, and that the surface of the wound is of a dull greyish colour, and, if recent, presents a smooth appearance. The skin at the edges of the wound sloughs, so that the aperture of entrance becomes enlarged. The textures in the track of the wound slough, and also those at the aperture of exit, so that the whole track becomes larger than it was at first. Entering with great force, the ball must affect the different textures in different degrees. Those textures lying in the immediate vicinity of the passing ball have their vitality completely destroyed, while those just beyond are more or less impaired. It may be laid down as a general rule that the vitality of the texture immediately in contact with the ball is almost if not altogether, destroyed. If the gun has been fired close, the skin will probably be blackened with the powder, some grains of which may lodge in the skin ; and sometimes the edges have a livid appearance at first.

The course which bullets take requires to be carefully attended to. A very slight object will deflect a ball from its course—such as a piece of cartilage or the angle of a rib—and so prevent the ball from going into the chest, but make it course round among the muscles, and pass out again. This gives rise to the appearance of the chest having been perforated by a ball, especially when the track of the bullet is not very plain.\* In

\* When the Duke of Edinburgh was fired at by an assassin at Sydney, the ball entered behind near the spinal column, and was extracted in front, near to the umbilicus, without having penetrated the thorax or abdomen.



other cases, a ball may enter, pass out, re-enter, and finally, lodge, so as to give the appearance of the part having been penetrated by two separate missiles. In such cases, we must attend carefully to the position of the limb at the time when the injury was received. In the case shewn in this sketch, a ball entered the back of the wrist, came out at the front of the fore-arm, re-entered the front of the arm, and then lodged under the skin, at the back of the upper arm. This injury looks at first as if it had been caused by two balls ; but, on examination, it was found that the man was taking aim when he received the wound, and the course of the ball was then easily understood. Again, if the leg be bent when the injury is received, a charge may enter twice, and come out again twice, in the same manner, as occurred in a case lately under my care in the hospital.

In some cases, the bullet may pass out by the aperture of entrance. In one case a bullet passed right round the neck, and all but dropped out again at the spot where it had entered. Sometimes two balls enter by the same opening ; and care must be taken to remove both. In civil practice we must be more careful, on account of the varying nature of the charge, and because the principal part of it may be left in, while only a small portion is removed.

We must, therefore, in all gunshot wounds, remember how easily a ball is deflected from its course, and must also attend to the position of the part at the time the injury was received.

The constitutional effects of gunshot wounds vary. They may depend in great measure on some peculiar condition, but in many cases they are altogether absent. When present, the surface of the body becomes chilled, there are generally tremors, and a certain amount of shock, the body is covered with a cold sweat, and a feeling of faintness comes on. There are many instances on record, however, in which men have received gunshot wounds in action without knowing it, their attention being first drawn to it by some one else ; and in many other cases the only sensation is that of a hard blow.



We now proceed to consider more in detail *Gunshot wounds, such as are met with in civil practice inflicted by small shot, or by the bursting of a gun, or by the entrance of wadding.*

If the gun be fired at a distance, the small shot may not give rise to any serious consequences, as, from the scattering of the shot, only a few pellets will lodge here and there, and only a slight shock will be felt. But if the charge of small shot be fired at all close to the body, or if it be enclosed in a cartridge, or tightly rammed down, the effects will be very serious, even more so sometimes than those resulting from a bullet wound. One form of cartridge—namely, the wire-cartridge—is particularly dangerous, as the wire is always more or less torn up, and the fine points of it are very apt to tear and lacerate the blood-vessels, giving rise to great hemorrhage even from the smaller vessels, just as in lacerated wounds ; and, therefore, there is a greater risk of primary hemorrhage from wounds made with small shot than from bullet wounds. In bullet wounds, and in many small-shot wounds, the risk of primary hemorrhage is not so great as that of secondary hemorrhage. The bullet may strike the sheath of the vessels, but they yield before the force, so that there is no bleeding at the time ; though the sloughing which takes place afterwards causes secondary hemorrhage.

The characters of the small-shot wound will differ as the shot enters *en masse*, or more or less scattered. If it enter *en masse*, and if the gun be fired close to the body, the appearance of the external wound is like the aperture of entrance in a bullet wound ; there is the same small rounded opening, but when we come to examine more closely, we can easily distinguish between a small-shot and bullet wound. In the former the edges are cut round, as it were, and somewhat ragged—not depressed as in the bullet wound—and always when the shot is fired very close, the powder is ingrained into the cellular tissue about the wound, giving it a dark greyish or blackened appearance. The aperture of exit is very different. As a general rule it is very much larger than the aperture of entrance. In

a case of gunshot wound of the abdomen recently in hospital, under my care, in which the charge lodged in the abdominal cavity, the aperture of exit in the abdominal parietes was smaller than the aperture of entrance. It is difficult to explain this ; unless it was due to the elasticity of the parts. The textures are usually much torn up, giving the aperture of exit a very ragged appearance, when compared with the aperture of exit in bullet wounds. If such a wound pass somewhat obliquely through the soft parts, it has in many cases a slit-like appearance. Even though the shot enter *en masse*, there is always more or less scattering of the shot along the track of the wound, tearing up the fascial and muscular textures, and if a bone be struck it is shattered completely ; there is therefore great suppuration and sloughing, as in lacerated wounds. In some cases the shot may pass out again *en masse*, when enclosed in a cartridge, and the effect will be like that of a ball : there will, however, be more destruction of parts, and contusion of the textures, and, consequently, a greater absolute loss of vitality. In some cases the shot strikes obliquely, and tears the surface, thrusting aside the superficial parts rather than entering. It is important to remember in lacerated wounds, and in this form of gunshot wounds, that when much muscular texture is torn away or sloughs afterwards, the wound will heal by contraction, and leave a tolerably useful limb, provided much skin be not lost ; but if a large amount of skin is torn off, and little muscular texture, the wound will not heal readily, as the contraction would be very great, and a comparatively useless limb would be left.

Another form of gunshot wound met with in civil practice is that inflicted by paper wadding only ; it also occurs in military practice, occasionally, with blank cartridge. In many cases the wound very closely resembles that caused by a bullet, and the track it makes is very much the same. From the loss of vitality of the parts, and consequent sloughing and irritation, it is a very troublesome, and sometimes a dangerous, form of wound. The great point is to examine the wound early, when we can distinguish the wadding from the other textures ; if left in for a short

time it becomes so softened, and soaked with blood and other discharges, that it is very difficult to distinguish it from the soft tissues. A careful examination must therefore be made as soon as possible, and all the paper removed.

As regards the progress of gunshot wounds in the soft parts, all these wounds have a tendency to suppurate and slough to a certain extent, and to heal by secondary intention or granulation—not by the first intention. Instances have occurred of gunshot wounds healing by the first intention, but these are the exceptions to the general rule—the very nature of the wound prevents it—the dead portions must be first got rid of by suppuration and sloughing. In most cases the track of the wound becomes inflamed, red, and swollen ; the edges of the apertures become everted, and suppuration soon commences ; the slough separates, and then the aperture changes in character, the orifice enlarges according to the extent of the loss of vitality of the soft textures. In many cases of small-shot wounds, from the very nature of the wound, the discharges take place freely ; parts of the torn fascial textures are got rid of at once, and often suppuration, rather than much sloughing, takes place. In some cases a large wound will heal very quickly, with little or no constitutional disturbance, but generally it is very different, even though the wound may not seem very serious, and where no hemorrhage of any consequence takes place.

In some cases the patient may go on well for some days, then rigors set in, the tongue gets foul, and other symptoms of febrile excitement arise. The limb becomes swollen and has a glistening appearance ; this condition occurs in small-shot as well as in bullet wounds. Mr. Guthrie, who described this symptom, attributed it to phlebitis. In cases of stabs, also, as already mentioned, the muscles are found to be softened and broken down in texture. This arises from an unhealthy form of inflammation being set up in the muscular textures, and leading to symptoms of pyæmia and secondary abscesses. I have seen a fatal result follow from this cause in what seemed a very trivial case of wound by small shot. Only a few pellets had struck the leg, and most of them only superficially. The symptoms de-

scribed above came on three weeks after injury. On examination of the wounded limb after death, two or three No. 4 shot were found to have penetrated the substance of the gastrocnemius, and its fibres were softened and studded with little points of suppuration.

In those cases where the shot strikes the surface rather than enters *en masse*, the wound goes on more favourably ; the degree of force is not so great, and the skin is thrust aside rather than injured ; and though sloughing of the deeper textures takes place, there is plenty of skin left to cover in the wound, and the results are generally favourable. In some cases, however, of gunshot wounds, whether inflicted by small shot or ball, there is a risk of secondary hemorrhage. Primary hemorrhage is not so common in bullet wounds as in those from small shot, especially if the shot be enclosed in a cartridge. A ball entering the thigh may not cut across the femoral artery, it may strike the sheath of the vessel and impair its vitality, and so lead to unhealthy supuration—the coat of the artery sloughs, giving rise to secondary hemorrhage ; or the same may take place with the femoral vein. In cases of secondary hemorrhage, when the bleeding vessel is secured, we must watch how the collateral circulation is carried on. In one of my cases, the brachial artery was exposed, and remained intact, though one of the veins was injured, and the ulnar nerve and inferior profunda artery divided. The limb became swollen, and about a week after the injury was received bleeding from the main artery took place, which was at once arrested by a ligature. In this case the circulation went on quite well by the remaining collateral branches, and the man made a good recovery with little loss of power in the arm.

As regards lesion of nerves. If a nerve be torn or partially divided, it should be completely divided, just as in lacerated wounds. If it be completely torn across, the torn end should be cut evenly across so as to prevent nervous irritation, which might give rise to tetanus ; partially-divided large nerves such as the sciatic or median, should not be cut across ; opiates are to be given to relieve the pain and constitutional irritation.

## LECTURE XXXI.

Wounds inflicted by the Bursting of Firearms—Their Treatment—General Treatment of Gunshot Injuries—Extraction of Balls and other Foreign Substances—Openings and Counter-Openings—After-Treatment—Risks of Secondary Hemorrhage—Prognosis—Cases.

BEFORE entering on the subject of the general treatment of gunshot wounds, I have a few observations to make regarding injuries inflicted by shot entering through a small aperture and then expanding, or by the bursting of firearms.

In many of these cases there can be no doubt as to the propriety of amputation ; and here the danger is rather in an inverse ratio to the size of the external wound, the danger being also greater if there is no aperture of exit. In one case of a gentleman under my care there was only a small opening in the palm of the hand, without any aperture of exit, and there was no great destruction of the bones, except some injury at the articulation of the carpus and metacarpus, but the shot had expanded laterally, tearing up the nerves, tendons, and blood-vessels in the palm, and so necessitated amputation. In all cases of gunshot wounds we must consider the degree and kind of force causing the injury, when estimating the danger of the wound and its effects, and considering the question of amputation.

Wounds from the bursting of firearms are met with very frequently in the hand and wrist, and often require amputation to be performed. But we are not to assume that there is anything peculiar in the nature of the injury itself which necessitates amputation ; it is required simply on account of the nature of the parts injured ; the joints being opened into, or the great vessels destroyed. But in many cases the bursting of a firearm or the explosion of a powder-flask does not cause



so much real injury as some other forms of wounds. It will depend in a great measure on what part of the gun inflicts the wound. If the breech be driven out and strike a person, then a very formidable injury is the result ; the heavy mass of metal projected with great force producing all the worst effects of a ball wound. If, however, a portion of thinner metal of the barrel strike, it cuts the parts rather than tears or contuses them ; and, when projected with great force, sometimes cuts as evenly as in an incised wound. And when in such cases amputation is requisite, the cut so made may form part of the line of incision for the operation—as in this thumb, where the lines of the incision were made by the fragments of the gun barrel. The sharp edge of the metal cuts the skin evenly, though the muscular textures are, of course, torn and twisted to a certain extent. Some wounds of this kind look much more formidable than they really are, while in contused and lacerated wounds we cannot always calculate the amount of danger, because the injuries often look less serious than they really are. A wound caused by the bursting of a gun usually at first looks very serious : the parts all blackened ; the muscles and tendons seem torn ; perhaps some of the bones are broken ; the smaller joints of the fingers opened into, and the parts so far lacerated. Yet, when we wash away, as far as possible, the gunpowder, and remove any wadding that may have entered ; the textures, and especially the skin, are found to be more cut than twisted or contused. Their vitality is therefore less affected, and often, by merely removing a part, we can save a very useful hand, though at first the injury may have appeared to require amputation of the whole. If the wound opens into the wrist-joint, and divides tendons, vessels, and nerves, complete amputation of the hand will be necessary. In other cases, the laceration caused by the bursting of a gun is so great as completely to shatter the arm, and then amputation must be performed higher up. When a shell bursts, the amount of force with which it strikes is very much greater, and, as a general rule, requires amputation ;



but even in these cases, a portion of a shell striking obliquely—if it does not fracture bones or injure any of the great vessels—will not inflict so much injury as a cannon ball.

There is in this form of gunshot wounds—as in incised and lacerated wounds—a great risk of hemorrhage. The sharp edge of the thin metal of a gun barrel will divide the vessels it comes in contact with, and cause primary hemorrhage, though it may occasionally pass close to large vessels without injuring them; but if it strikes them they will be cut.

We shall now consider the *Treatment of Gunshot Wounds*. The treatment of a flesh bullet-wound is very simple. The first point to be attended to is to ascertain whether the ball has passed out or not. If it has lodged, we must ascertain its position, and then extract it by enlarging the wound when necessary. If the ball has passed nearly across the limb, and has lodged near the opposite side from where it entered, it is best to make a counter-opening, and cut down upon the ball, and thus complete the track of the wound, so as to allow discharge and sloughs to escape readily. If the ball lies deeply, or has passed about half-way across the limb, then the aperture of entrance should be enlarged, and the ball extracted with the bullet-forceps, without making any counter-opening. Some surgeons recommend that when the ball is deeply seated, or where it has lodged near important organs, it should be left alone, and not interfered with. This is not good practice, unless it so happen that we cannot reach the ball without endangering some of the great vessels of the part; but even then, the practice is questionable on account of the very fact that the ball by lying near great vessels will injuriously affect these vessels from the sloughing and suppuration, which will be set up; and, therefore, in all cases where it is practicable, the ball should be extracted at once. For example, in the case of a ball entering the thigh and lodging close upon the course of the femoral vessels, the opening should be enlarged and the ball extracted. The presence of the ball, if left in, would be very apt to give rise to irritation and inflammation of the parts, and so cause a great risk of secondary

hemorrhage. If there be a risk of bleeding, it is better to meet it at once than afterwards, under less favourable circumstances. There is scarcely a case in which a ball should not be extracted if possible ; but more especially is it necessary to extract any wadding or portion of dress which may have entered, as these would give rise to great irritation, and from becoming softened in the discharge, would not after a time be easily recognised. The first thing to be done in a flesh bullet-wound, therefore, is to ascertain the position of the ball, and then extract it, either by enlarging the aperture of entrance, or by making a counter-opening if the ball has lodged near the opposite side of the limb. Of course, if the ball has entered a cavity, such as the chest or abdomen, we could not attempt to extract it from among the viscera. In such cases we cannot interfere. There is another reason for extracting a ball when possible, namely, that the patient's mind never feels quite at ease when the ball is left, and a good deal of mental irritation is kept up. In flesh wounds inflicted by small-shot, it is necessary to remove all wadding and pellets ; and it is often advisable to make a counter-opening, so as to let the wound be washed out freely, and the track kept clear. But here we need not try to get rid of every stray pellet, because from the scattering of the shot it is impossible to tell where they have all gone to ; and besides, if left, they remain quiescent, and do not cause much irritation afterwards. If fired near the body, the pellets sometimes take very peculiar directions, and cannot be found easily. In a wound of the hip which I attended, some pellets passed out per urethram from the bladder without any bad effects. Certainly, with much less mischief than would have happened had an attempt been made to extract them had their position been known.

The treatment of gunshot wounds, after the extraction of the foreign bodies, is very simple. The surface and track of the wound may be moistened with very dilute carbolic acid or other antiseptic. Then apply cold or tepid water-dressings, lint dipped in carbolic oil, on the surface and along the track of the wound, washing out the wound occasionally, if there be a counter-open-

ing. These local measures, with the use of antiphlogistic diet and medicines, along with opiates to allay irritation, are the chief points in the treatment. When inflammation is set up, with redness extending from the wound, and some swelling along the margins, then we apply warm water dressings or poultices. When there is much tension dilate freely ; and if there be much sloughing, use charcoal poultices or some Condyl's lotion to get rid of the fætor. In gunshot injuries of the fore-arm and leg, the tepid bath, as in lacerated wounds, answers admirably. When the sloughs are separating, and granulations beginning to appear, the patient's strength must be supported. The diet should be more nourishing and stimulating than before. The limb may then be supported by a bandage from below upwards, and the solution of chlorinated soda, or other stimulating lotions, applied to the wound.

The question of amputation, either primary or secondary, often arises in gunshot injuries of the soft parts from the extent of destruction of tissues. Where a considerable amount of the deep textures is destroyed, or carried away, whilst the skin is not much injured, nor the great vessels or nerves divided, the wound will heal up readily, just as in lacerated wounds of a similar description, and therefore amputation is not required.

Secondary hemorrhage follows after wounds from bullets and from small shot. If a large vessel have given way, we must enlarge the wound and tie the vessel at a little distance above and below the bleeding point. We may use the ordinary ligature, or acupressure. The rest of the vessel is healthy, and the collateral circulation is likely to be sufficient for nutrition. Where the circulation is not re-established, then amputation is, of course, necessary. Secondary hemorrhage occasionally takes place in another form in flesh wounds. It is described by Mr. Guthrie, but is not common. It consists in a persistent oozing from the surface of the wound, and depends apparently on constitutional causes entirely. It is generally preceded by great febrile excitement. The parts get a glazed and swollen appearance, and from part of the injured surface smart oozing comes on, which may

be temporarily arrested, but occurs again and again till the patient is exhausted. The bleeding does not come from any particular vessel. It may even occur when the patient is convalescent. Mr. Guthrie attributed it to the state of the patient. It occurred in several cases in the Peninsular war, but it is not a common form of hemorrhage, and I have never seen it occur after gunshot wounds, though I have seen a form of hemorrhage like it after operations for malignant disease—a grumous bloody discharge going on incessantly from the whole surface of the wound.

As regards the prognosis of bullet flesh wounds : If no bone be broken, or if no great vessel be injured, and if the ball be extracted immediately, the result will most likely be favourable ; though fatal consequences may follow from the softening of the muscular texture, and from pyæmia and phlebitis setting in. The prognosis in the case of small-shot flesh wounds is not so favourable, as the amount of injury is difficult to estimate. In one case the injury appeared very trifling, and the surgeon tried to save the hand, but in a few days inflammation set in, with great swelling of the limb, and the patient was placed under my care. I then made incisions in different parts of the limb to allow of the escape of the discharges, and removed all the wadding ; the limb was placed in a tepid bath, and the other treatment carefully attended to ; but, notwithstanding, secondary amputation was required, and this had to be performed in the upper arm, and under much less favourable circumstances than if partial amputation of the hand had been performed at once. In this case some of the metacarpal bones were injured, having the periosteum stripped off, and this formed an important feature in the injury. In another case under my care the injury looked much more formidable : the man had received the shot from both barrels of a gun in the fore-arm, where the charges had lodged ; the whole limb, when he came into the hospital, was tense, painful, and erysipelatous, and the pulse could not be felt ; but the patient was not in a state for amputation being performed. Here I enlarged the opening of entrance, and

removed all the wadding and pellets within reach, together with portions of torn muscles, and also made a counter-opening. Charcoal poultices and warm-water dressings were then applied; the sloughs separated, some more pellets came away, then the wound granulated and healed perfectly, the irritative fever ceased under local and constitutional treatment, and this man was able to take part in rowing and working at the herring-fishing three or four months afterwards. These two cases, when contrasted, will show how difficult it is to estimate the amount of injury inflicted by small shot: the one case required amputation, though it did not at first appear to be such a serious injury as the other—probably owing to the metacarpal bones being injured and the confined nature of the wound. In another case lately in hospital, a boy received a small-shot wound in the axilla, which looked comparatively trifling, but the subscapular muscle was torn up and the surface of the scapula laid bare to a small extent. The case went on well for some time; but ultimately the patient died from pyæmia and secondary abscess, resulting, I believe, from the injury to the bone. In another case of a young gentleman under my care lately, for a small-shot wound of the hip, the greater part of the glutei muscles were torn away, the sciatic notch and nerve exposed, and the gluteal artery wounded, but no bone was laid bare; and this patient made a good recovery, the wound healing with very little scar by the contraction of the skin which had been thrust aside. It is always therefore, I believe, an unfavourable condition when bone is laid bare, as this increases the danger. The two cases related which recovered, looked much more formidable than the other two, but in neither of them was any bone injured; while, in the case which required secondary amputation, the metacarpal bones were deprived of their periosteum, and in the fatal wound in the axilla, a portion of the scapula was denuded.



## LECTURE XXXII.

Gunshot Injuries of Bones and Joints—Effects produced by a Ball on the Denser Portions of Bone, as compared with those produced on the Cancellated Texture—Special Risks attending on Injuries of Joints—Views of Dupuytren and Hennen regarding their Treatment—Excision *v.* Amputation—Special Advantages of Primary Excision—Statistics—General Rules for Amputation when necessary.

By this time you will have learned that the injuries of which we have been speaking are very much modified or aggravated, not only by the nature, force, and direction of the missile employed, but also by the quality of the texture against which it strikes. And nowhere do we find this better exemplified than in connection with—

GUNSHOT INJURIES OF BONES AND JOINTS.—When a ball strikes the dense part of a bone it produces very different and much more destructive results, than when the softer or cancellated texture is struck. A ball striking the dense shaft of a bone breaks it into pieces, but it does not break up the cancellated texture in the same way—it sinks into it, on account of the texture offering less resistance. When a ball strikes along the surface of a bone like the ilium, it forms a deep rut in it; but when the ball strikes the shaft of a bone, it shatters the whole bone, not merely where it strikes, but the whole bone is broken up, fissures extending both longitudinally and transversely. When a bullet passes through the softer part of a bone like the tibia, it may form a rut in it, and leave a rounded opening like that made by a bullet in a flesh wound. When a somewhat spent ball strikes a bone, it leaves an aperture of entrance with the edges depressed; but the aperture of exit is different—there the bone is broken up by the force of the passing ball. The effects produced are—that the vitality of the bone is completely destroyed, blood is effused



GUNSHOT WOUNDS.

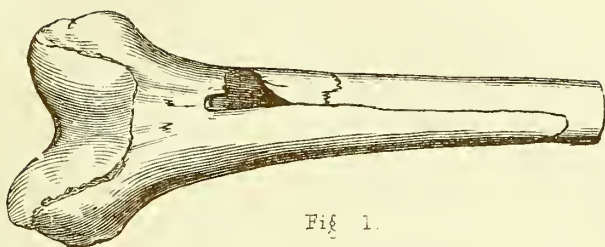


Fig. 1.

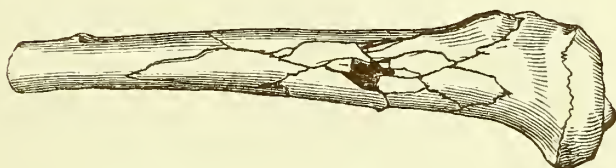


Fig. 2.

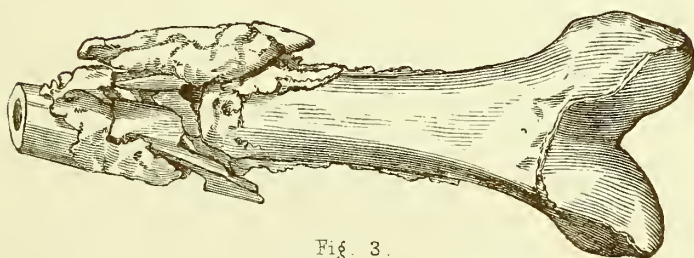


Fig. 3.



Fig. 4.



into the Haversian canals, and an unfavourable form of inflammation extends throughout the bone, causing acute necrosis or death of portions of the bone. When the shaft is struck the worst effects of comminuted fracture are produced; the dense texture has its vitality at once and completely destroyed, and the form of the fracture gives rise to longitudinal fissures, which are very unusual in other fractures; complete comminution and separation of different parts of the bone take place, and the periosteum is also separated from the bone, the vitality of the internal Haversian structure being also destroyed. Such an injury is therefore the most intense which can be inflicted upon a bone, and the harder the bone the more serious will be the effects produced. In the cancellated texture of bone the ball may pass through and leave a rounded opening, without causing any direct or immediate injury to the parts around, though, sooner or later, it does give rise to this. We sometimes find in the bones of animals, and especially in textures closely resembling bone, such as the tusks of different animals, that a ball has lodged and become encysted, as it is called, and it may lie there for years without producing any bad effects. So in man also, when a bullet strikes the cancellated texture of a bone, it may lodge in it and remain for a long time without doing any harm, and this sometimes happens. Amputation of a limb, however, may be required many months after the receipt of an injury of this kind, owing to the bone becoming affected with a form of caries.

In the upper extremity we may often attempt to save the limb after a gunshot injury, when we could not do so in the lower extremity. Formerly it was laid down as a rule, that in gunshot injuries of the femur, amputation was always required; but there are cases where, under favourable circumstances, we may be warranted in trying to save the limb. When the shaft of the femur or tibia is extensively broken up, then primary amputation is the safest treatment, because, even under the most favourable circumstances, when the patient does not require to be moved, and when every appliance is at hand, the process of healing is very prolonged and often ultimately fails. Moreover,

the limb which is saved is deformed and shortened, and the patient is subject to a very great risk from the suppuration, and from abscesses forming in the soft parts around the bone, and the chances of pyæmia supervening are very great. As a general rule, gunshot fractures of the femur and tibia are cases where amputation is necessary. When the bone is hit by small-shot striking *en masse*, the amount of injury caused is still greater; the bone is broken up into fragments, the periosteum is stripped off, and the surrounding textures much torn up. In these cases, therefore, amputation is even more necessary than when the bone is injured by a ball. In the upper extremity we may run some risk for the chance of saving the limb; for even, though the humerus be deformed after saving the limb, if the fore-arm and hand be left uninjured, the result is a sufficient reward for the risk. Besides, the vitality of the textures in the upper extremity is greater than in the inferior extremities, being nearer the centre of circulation. The treatment also is easier, as the arm can be slung. And in military practice, a patient with a fractured humerus can be moved about much more easily than one whose femur is broken. So that, for these reasons, the arm can often be saved when the leg cannot.

When a ball strikes the cancellated texture of a bone it produces different results. It generally makes a rut through the surface of the bone, and passes out again—just as in the softer textures—by a circular opening, without shattering or comminuting the bone, unless the ball strikes with great force. In the bones of the cranium the ball sometimes passes out, making merely a small circular opening, though generally the inner table is extensively broken up; and in such cases trepanning must be performed. When the ball strikes the cancellated texture of a bone in the neighbourhood of a joint, it may—according to the size of the ball and the particular bone struck—either rest in the cancellated texture of the condyloid end of the bone without entering into the joint, or it may break up, or else lodge in the joint. Near the knee joint—especially in the large condyloid extremity of the femur—the ball may enter

GUNSHOT WOUNDS.

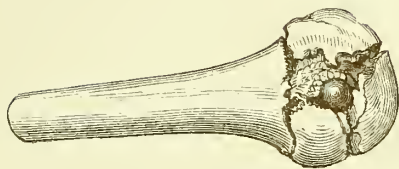


Fig. 1



Fig. 5.

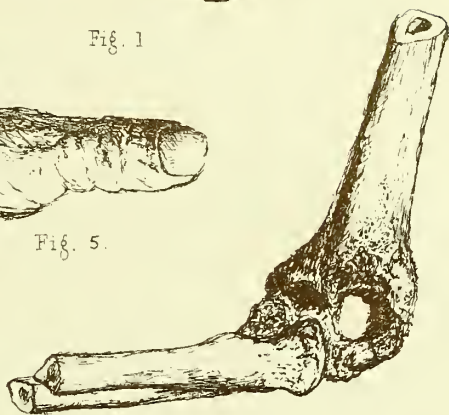


Fig 2 .



Fig. 3.

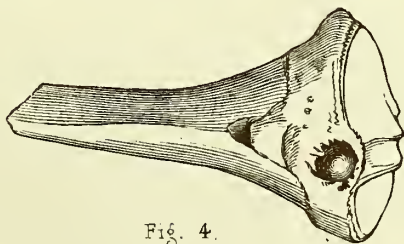


Fig. 4.





at the side without opening the synovial sac, and lodge in the large amount of cancellated texture there, and it may remain there for many years, sometimes without producing any bad effects, beyond causing stiffness of the joint and the risk of exciting disease. The secondary effects of gunshot injuries of bone must, however, always be taken into account, as they may give rise to a disease analogous to caries, and necessitate amputation long after the receipt of the injury. Sooner or later such injuries lead to suppuration, and give much distress to the patient, and ultimately may necessitate operations, which would have been much better done at first. If the ball has entered the joint, or broken up the bone into the joint, or if it lie very close to the articular texture, so as to project the articular surface of the bone before it, then the injury is a very dangerous one.

At one time, all injuries of joints—whether inflicted by a ball or by small shot—were considered as cases for amputation. All wounds of joints are dangerous, and gunshot wounds are especially so, from the foreign body being generally lodged in the joint. Hence, the general experience of military surgeons, up to A.D. 1800, was, that in gunshot injuries of joints in the lower extremity, and even in the upper extremity, amputation was as a rule necessary. But it is an operation which should be avoided if possible, provided that at the same time, the source of irritation can be got rid of, and a tolerably useful limb left. Afterwards, some surgeons adopted the expectant plan of treatment, which consisted in applying hot or cold applications to the limb, and keeping it at rest, so as to procure ankylosis. In 1830 many cases of these injuries occurred in Paris, and were carefully investigated by the late Baron Dupuytren. He pointed out that, in the upper extremity, and even in the lower extremity, in hospital practice, where all proper appliances can be readily obtained, many limbs might be saved by extracting the ball, and allowing the joint to ankylose, though, of course, the joint would be quite stiff, and the healing process would take a long time. If the great vessels of the limb have been injured, then amputation would be required.

The same had been pointed out by Hennen and other military surgeons, who showed that in certain cases wounds of joints did get better, and surgeons therefore became more careful about amputating in all cases. But when we come to look at the results of their experience, we are led to the conclusion that perhaps amputation might have proved better treatment, from the number of lives lost in attempting to save limbs, and from the comparatively useless limbs left.

During the war in Algeria, and that in Schleswig-Holstein in 1848, the plan of treatment was first generally adopted which had been often proposed but never carried into effect—namely, PRIMARY EXCISION of the wounded joint. In all cases of injuries of joints caused by bullets, where the soft parts are merely traversed by the ball, and where the joint is directly or indirectly injured by the ball passing through or near it, this is the best operation that can be performed. It is a conservative operation, and is not attended with the same risks as is amputation or the expectant treatment. If neither amputation nor excision be performed, secondary disease is likely to follow—a peculiar chronic affection of the bone takes place, abscesses form about the joint, and the patient's health gives way, even though ankylosis may have occurred. Such cases show the risk run in trying to save the limb. If excision of the joint be performed as soon after the injury is received as possible, the limb is saved, the source of irritation leading to secondary disease is got rid of, there is less chance of bad consequences, and a much more useful limb is left than if amputation had been performed or a cure by ankylosis obtained: the results of primary excision in such cases are much more favourable than those of amputation or any other method of treatment. In ordinary surgical practice we often perform excision of joints secondarily, for the effects of fractures or other injuries leading to stiffness of the joint from ankylosis. The results given by Professor Langenbeck of Berlin, M. Baudens in Algeria, and Eschmarck of Holstein, are very favourable: Out of 11 primary excisions of the shoulder-joint 10 recovered, and only 1 died. Out of 15

cases submitted to expectant treatment, because less severely wounded, 8 died from exhausting suppuration, 4 left with fistulous openings, and 3 were cured by secondary excisions. Out of 40 resections of the elbow only 6 died, 1 required secondary amputation for gangrene of the fore-arm. Of the rest, some were anchylosed, which result is attributed—justly, I think—to the operation being performed secondarily. I think that to give the operation a fair chance it should be performed as soon after the receipt of the injury as possible; because inflammation and suppuration soon set in, and the operation has then to be performed under great disadvantages. In injuries of joints caused by small shot, excision is unsuitable, because the shot expands after entering, breaks up the bone into fragments, and tears all the surrounding soft parts. These injuries are therefore not to be considered in the same category as the former, where there is simply the track of the ball, which may be converted into part of the incision.

Indeed a method of treating gunshot wounds of the soft parts has been tried in America during the late war—namely, to convert them into incised wounds—and the results in some cases have been favourable, and in excision of the joint, this is what we do as regards the soft parts wounded. In small-shot wounds amputation is necessary as a rule, though there are exceptional cases on record in which the joint was greatly injured and yet the limb saved. In the lower extremity, the treatment of gunshot wounds of the hip, knee, and ankle presents points of difference from that of injuries of the arm. In civil practice, or in cases where there is an hospital at hand, and in military practice, when an army is in position, we may attempt primary excision of the knee or ankle; but when we require to transport the wounded a considerable distance, and when the patient is subjected to unfavourable conditions, excision cannot be expected to prove so successful. In the upper extremity, amputation should not be performed till excision has been tried; if the bone be found shattered into the shaft, then amputation must be performed. When the ball is lodged in a bone near the surface we proceed on the

same principle as in bullet wounds of the soft parts. We cut down upon the joint on the outside, so as to avoid opening the joint, which the ball may not have done, and then, with a gouge or pair of sharp-edged bullet-forceps, extract the ball from the bone, or with a trepan take off part of the bone covering the ball ; we can thus extract the ball from the cancellated texture as easily as from the soft parts. We thus get rid of the foreign body, and prevent bad consequences following, such as abscesses and secondary disease ; and it is perhaps better to gouge away some of the cancellated texture in which the ball was lying. In the upper extremity, however, I would much prefer excision to any attempt to extract the ball, because the ball can hardly have struck the head or condyles of the humerus or the upper part of the ulna without implicating the shoulder or elbow joints more or less directly.

In most cases of injuries to bones and joints from shot, cannon balls, and shells, the limb is either completely, or all but, torn from the trunk ; in such cases therefore, or where a spent ball has struck a limb and reduced it to a pulp, there can be no doubt as to the propriety of amputation. If the injury be on the trunk the patient is generally beyond relief. When the bullet or piece of shell strikes obliquely, it may not do much more harm than the bursting of a gun-barrel, but this is a rare occurrence, and when it happens, the case is to be treated in the ordinary way. When a round shot strikes a limb, even when it is spent, the amount of force is such that though the bone does not appear to be much injured, if the soft parts are, then it is a case for amputation. In gunshot wounds of the cranial bones, when the ball partially or completely perforates the bones of the cranium, trepanning is necessary ; if the ball has not passed out, we can feel it, and it should be extracted during the operation. Even when the ball passes between the bone and the scalp, the result is almost always unfavourable ; great effusion of blood takes place between the bone and the dura mater, and the loss of vitality of the bone itself is so great as to lead to necrosis afterwards, and on examination the bone is found to be full of small fissures. In one case of a

man under my care, the injury looked as if it had been inflicted by the butt-end of a gun, but the edges were blackened and a few pellets had lodged. The man was suffering from symptoms of compression; the bone was quite comminuted, but no hole was to be seen. As soon, however, as one fragment was taken out the rest became quite loose; the dura mater was not visibly injured, but in three or four days it lost its natural appearance, and that part of it, corresponding to the injury of the bone, sloughed.

As regards the general rules for amputation in gunshot injuries: These are very much the same as in railway injuries, and other severe lacerated and contused wounds. One point of difference to be attended to, however, is that it may be necessitated by what may appear a slight injury, implicating only one or two important textures, as for example, the femoral artery or vein may be injured without any of the other important parts in the neighbourhood, and then primary amputation is necessary, as the amount of subsequent swelling interferes with the collateral circulation, and a sort of low traumatic gangrene takes place. In the upper extremity, in a similar case, I would not have recourse to amputation. If secondary hemorrhage does take place, by tying the injured artery, and watching to see that the collateral circulation is carried on properly, we can often save the limb; but when the femoral artery or vein is injured there is not the same chance of saving the limb, and therefore amputation is required. When the great sciatic nerve is injured, primary amputation is generally considered necessary, because the whole innervation of the leg, at least below the knee, is impaired; but still this is not so urgent a case as when the femoral vessels are injured, and I would rather wait a little to see whether innervation might be carried on from other sources. In such cases, when gangrene sets in, it is of a subacute or chronic character. When the femur or tibia, or even the humerus, is comminuted to a great extent, and when there is much bruising of the soft parts along with such an injury—Amputate. Shell or a round shot striking a limb necessitates amputation generally. These general rules, however, must be

judged of in connection with the circumstances of each case. Even in contused wounds there is often great danger from trying to save the limb, and in gunshot wounds this danger is still greater. Hence, as before mentioned, we must always keep in mind the amount, as well as the kind of force which caused the injury, and the circumstances in which the patient is placed as regards means of treatment.



## LECTURE XXXIII.

Burns and Scalds—The Conditions which regulate their Severity, as regards the Constitution of the Patient, the Temperature of the Liquid or Metal, and the Site of the Injury—The Comparative Severity of Burns and Scalds—Shock—The more remote Constitutional Effects of these Injuries, as Congestion of the Lungs and Kidneys—Treatment—Amputation—General Remarks on Operations for Removal of Deformities.

THERE are very few injuries which have received more attention than BURNS AND SCALDS, and in few have so many remedies been proposed.

This class of injuries is divided into two forms : *Scalds*, or injuries inflicted by hot liquids ; and *Burns*, which are inflicted by fire or by hot metal.

In estimating the severity of a burn or scald we must take into account several conditions ; and it is perhaps more difficult to form a correct estimate in these injuries than in any other. In all other injuries there is a limited force causing them. Here, the effects depend on the radiation of the heat, and the length of time that the part has been exposed to it. One condition should never be forgotten ; and it is this, that the general health of the patient, prior to the injury, has a most important bearing on the result ; more so, perhaps, than in any other injury. In burns it makes a great difference as regards the healing process, and as regards operations afterwards, whether the part burned has a large amount of fat under the integument or not. In scalds, we must take into account the nature of the boiling liquid—whether it be water, or oil, or a liquid which retains the temperature longer, and which requires a higher heat than 212° F. for its boiling point. Also whether the liquid contains some peculiar substance in solution, and so possesses acrid qualities besides the mere heat. All these conditions must be taken

into account in estimating the amount of injury done. In regard to scalds by boiling water, the temperature can never be above 212° F., and is very generally below it. When the water is upset, a certain amount of temperature is lost by the time it reaches the body, and if the part be covered with woollen clothing—which is a bad conductor of heat—still more of the temperature is lost, as the water permeates through the dress; and so, in many cases of scalds from boiling water, comparatively trifling effects are produced to what we might expect. But if a person falls into boiling water, then the effects are much more intense, on account of the water being at the boiling-point. If boiling water be applied almost directly to the surface of the skin it will seldom completely destroy the vitality of the true skin or cutis. It may do so partially, but seldom completely over a large surface, and it never primarily affects the cellular tissue lying under the true skin. There may be effusion, and a slight amount of inflammatory action, but never any peculiar alteration in the cellular tissue—far less in the fascial or muscular textures. In scalds there are generally vesications over the burned part, caused by separation of the cuticle from the true skin. As a general rule, a scald is a less severe injury than a burn. When a scald is produced by other fluids than water—such as boiling oil, or chemical liquids; or in breweries—wherever the fluid requires a higher temperature than 212° F. to boil it—there is a greater intensity of heat, and, therefore, a greater effect produced upon the cutis, the vitality of which may be lost over a large surface, and an unhealthy condition may be brought on in the subcutaneous cellular tissue. Another point to be attended to in scalds, and also in burns, is that the danger to life depends partly on the extent of surface affected, and also on the part of the body injured. When the surface burnt covers a part of the body not essential to life, the danger is much less than when there is any risk to vital parts. Hence a scalded limb is a less formidable injury than a scald on such parts as the thorax and abdomen, where there is a chance of the contained viscera being affected secondarily. But if a limb or other

part of the body be scalded over a large surface, there is a special danger caused by the obstacle so raised to the insensible cutaneous transpiration. This is entirely and completely arrested, and the work must be carried on by other parts of the skin ; but the irritation and fever which follow upon the injury prevent this being done properly, and so the kidneys and other internal secreting organs become congested. They have more work to do, and soon cease to perform their functions properly, and this leads to very serious consequences. Sometimes inflammation occurs in serous membranes in cavities, at a distance from the injured part, and the brain may become secondarily affected.

A Burn is caused by intense heat, such as fire, or by heated metal, which soon destroys the vitality of the part to which it is applied. In burns, as in scalds, various conditions must be kept in mind in estimating the severity of the injury. The clothes of the patient may take fire, and if they are bad conductors of heat, the burns will not be equal in intensity, but will be more severe at some parts than at others. In burns from heated metal, the surface to which it is applied is immediately destroyed ; but in accidents in foundries, where the molten metal often falls on the feet, the loss of vitality is not so great as might be expected. This is due to the circumstance of the metal being in contact with the part only for a very short space of time. When it falls on the dorsum of the foot, it immediately rolls off, and does not rest on it for any length of time ; but if the molten metal get between the shoe and the foot, so that it cannot roll off, then the vitality of the part is at once and completely destroyed, and great destruction of texture is produced. In all cases, the local effects of burns by fire are very severe, compared with those produced by scalds. In the one case, we have merely destruction of the skin, and sometimes not even that ; while in the burn, there is not only destruction of the true skin and of the subjacent cellular tissue, but beyond that there are changes going on which, though not destructive, have a most important bearing on the after progress of the case.

The parts directly subjected to the heat are destroyed, the parts beyond that are destroyed also if the heat has been long applied ; but the parts beyond that again, though their vitality is not absolutely destroyed, undergo a peculiar change. The cellular tissue under the skin, if the burn has not been sufficiently severe to destroy its vitality, loses its elasticity, and forms a substratum of solid agglutinated material, which prevents the contraction of the wound afterwards, and to this is to be attributed the slow healing of the wound. This solid substratum drags the skin from all directions, causing great deformity sometimes, and under it the muscular texture is generally affected also. This is a most important peculiarity in burns. Contrast a burn with the eschar made by a potential cautery, which destroys the vitality of the skin and cellular tissue quite as much as the burn. The eschar separates, and the wound gapes, but then the healing action begins, inflammation and swelling subside, the cellular tissue is not affected as in the burn, the wound contracts and heals readily, and there is no cicatrix, except at the point where the caustics were applied. While in a burn involving the same extent of surface, the healing process would be slow, and would leave much greater contraction and harder cicatrix on account of the heat radiating deeper and affecting some of the textures permanently, consolidating them, and so hindering them from healing by contraction.

Scalds and burns have certain dangers in common. One of these is the interruption to the cutaneous transpiration, and also the irritation produced by a large surface being affected with intense pain. The first effect noticed from a burn or scald is the shock or collapse, which is very great, when the injury is severe. The pulse is weak, the skin which has not been burned is cold and clammy, the patient has a sunken look, and though great pain is felt, it is still so far dulled at first by the shock. Even when the body is charred in a great measure, and the pain is very great, still, looking at the amount of surface burned, and the severity of the accident, we wonder how little complaint of actual pain there is. There is a feeling of restlessness and of

numbness from the very severity of the injury. But though the expression of pain is not so great as might have been expected, the pain must be intense.

The *Treatment* of these injuries must be conducted with care, tenderness, and promptitude. The state of collapse resulting from the intense irritation and suffering must be met very energetically, for during this stage death often ensues. In scalds this danger is sometimes very great, but it must be met with somewhat more caution than in burns, where the risk of death during collapse is also great.

In scalds, the patient very frequently gets over the first shock, but if there has been any over-stimulation then there is a great risk of secondary dangers coming on. In these injuries, therefore, the stimulation must be carried on more cautiously than in burns. Opiates in large doses, to relieve the pain, should be given rather than stimulants. A small quantity of the latter may be given from time to time. And of these the best is champagne, with a little brandy. But the effect of these must be carefully watched. The use of opiates is absolutely indicated to procure rest, and relieve the pain and suffering. And they also—especially with antimony or ipecacuan—act as diaphoretics, and determine towards the skin, and so relieve the risk from the arrested cutaneous transpiration. When the burn is very severe—so much so as to be almost a hopeless case—while we give stimulants from the first, we must also do more than give opiates to relieve the pain. And here the use of chloroform is indicated. It should be given only in sufficient quantities to soothe the patient; and in this way he can be rendered insensible to the pain for a long time.

As regards the constitutional effects of burns. We must keep in mind the liability of certain organs to become congested from their proximity to the burned part, or from other causes, as when the chest is burned. We must watch for the symptoms of congestion coming on, and meet them on the general principles of treating such disorders; but these are not cases in which active depletion may be resorted to to relieve the congestion. When



the kidneys become congested, from the arrested cutaneous transpiration, we must be careful not to stimulate them by giving strong diuretics, such as the sweet spirit of nitre. In these cases ; ærated potash water answers very well, it acts on the kidneys as a diluent without overstimulating them. We must watch for any symptoms of acute albuminuria coming on, and if these occur, we may require to apply leeches or a sinapism over the kidneys, so as to relieve the congestion of the organs in the first instance, and give internally small doses of Dover's powder, with the potash water, or the acetate of potash in solution.

The number of local applications which have been proposed for burns and scalds is very great ; amongst others, turpentine, oil, collodion, vinegar, flour, wadding, and carbolic acid, all have been used with more or less success. One point should be kept in mind—namely this, that the patient feels great relief from having the part protected from the air, and from the pressure of the bed-clothes, and therefore the use of cotton wadding wrapped round the limb answers very well. If a scald be seen at the very first, before any vesications have risen, I know of no better application than cold-water cloths placed round the limb. This immediately relieves the pain and often prevents vesications from rising. But if the vesications have risen, then before applying cold-water cloths or any other dressing whatever, we should let out the fluid in the vesications with the point of a needle or a pair of scissors, so as to smooth down the cuticle. If the cuticle be ruffled we expose a raw irritable surface, which does much harm. Afterwards we may apply a piece of lint soaked in Carron oil, or even in cold water, and then wrap some wadding round the limb, and in many cases, with rest and proper internal treatment, the part will heal readily without much irritation or pain. In burns, the best plan is to wrap the part in wadding at once. Mr. Liston used to object to this treatment, considering it to be a dirty application, and instead of it he used to apply flour to the part, so as to form a crust on it, and when the discharge soaked through more flour was dusted on till a sort of paste was formed. But this never appeared to me to be a very clear application ; it forms a mass of dirt



inside with a little clean flour on the top, and in my opinion is not so cleanly as the wadding. When there is much irritation and inflammation, or where a large surface is burned, then warm water lint, or a soft poultice, may be applied instead of the wadding. Carron oil is another application often used, and in many cases relieves the pain, and besides allows the dressing to be more easily changed.

As regards amputation—either primary or secondary—in cases of burns and scalds : Primary amputation is sometimes, though not often, required when the limb is very much burnt ; but here there is a difficulty in calculating the extent of the radiation of the heat, and how far the injury is limited. In many cases, where the burn reaches much above the middle of the arm, I would amputate at the shoulder-joint, because the risk of the weak action or sloughing extending is very great, and the operation is not more dangerous than sawing through the humerus. It is not generally difficult to decide whether to amputate secondarily or not—when the patient is becoming exhausted from the irritation and discharge, and when it is desirable to remove deformity, as in the limbs I show you. The limb should be amputated, and very soon afterwards the patient's general health becomes re-established. The difficulty is in the intermediary class of cases, where the irritative fever still exists along with discharge, and where every dressing of the wound is attended with great suffering—then we must do something to relieve the patient, though the chances are much against amputation. I have performed the operation under such circumstances, in some cases successfully, but the results are not usually so. The intense amount of suffering, however, would alone produce death, and so we are forced to amputate sometimes by way of giving the patient the only chance. The operation relieves the intense sufferings, and acts as a palliative ; and although the chances of recovery are very small indeed, still we are bound to give the patient what little chance there is.

Operations are sometimes required secondarily on account of the great contraction of the parts, which is caused by

agglutination of the textures. In such cases we require not merely to cut across the tight band of skin, but to dissect it from the agglutinated tissue, going beyond it into the healthy textures, and bringing the margins together in the longitudinal direction. Or we may do it by dissecting and transplanting flaps of healthy skin to fill up the gap. In some cases, after such operations on the limbs, splints must be applied to prevent contraction from again taking place. If we leave any part of the tissue undissected from the agglutinated base, the wound will not heal readily. In the arm I have frequently operated in this way with good success ; but in the cases of great contraction of the face and neck, the chances of a good result are doubtful.

There is much careful consideration required in determining on the propriety of operating, and in planning the mode of procedure in these cases of deformity resulting from burns. And though it is impossible to lay down rules for such irregular operations, as each case demands its special consideration ; yet, before concluding this lecture, I think it may be useful to indicate in a suggestive form, the principal points to be kept in view.

As regards the propriety of operating. We should ascertain the length of time for which the contraction has existed, and whether the injury was received in early life.

In many cases where the contraction has existed for a long series of years, and especially if the burn occurred in childhood, or indeed before adult life, the changes are not confined to the soft textures. The bones and joints in the vicinity have probably undergone such alteration in form and structure, as to render removal of deformity or restoration of the parts to their natural state quite hopeless, and so to contra-indicate operative interference. Thus in cases of contractions following extensive burns of the face and neck or upper part of the chest, the temporo-maxillary articulations are often either completely ankylosed or altered in form and movement ; whilst the ascending and horizontal rami of the lower jaw are so changed in form and relation to each other as to resemble the jaw of some of the lower animals. In such cases operative interference can only end in failure.

The same considerations apply to similar contractions of the limbs of long standing resulting from burns, and in which the muscles are probably altered in structure. But all rules have exceptions. I can conceive of a case in which, by relieving the contraction of the soft parts and excising an anchylosed elbow-joint, a good result might be obtained.

In cases in which the soft textures alone are implicated, we should keep in view the original extent of skin destroyed, so as to be able in some measure to calculate the amount required to fill up the gap which will result from the retraction of the skin which had been dragged from neighbouring surfaces when we free the contraction. Unless the operator takes this into consideration he may find himself very awkwardly placed. In many cases the original extent of lost skin is such as to forbid operation.

There are certain conditions favourable to success in these cases, such as a large amount of subcutaneous fat, as its absorption permits of the skin closing in with less subsequent contraction. The natural laxity of the skin also, in certain regions of the body, such as the abdomen and perineum, permits of the healing process progressing more quickly, and with less contraction and deformity than in such regions as the scalp or back.

Finally, as regards the method of operation. I have already told you that we must not be content with merely dividing the contraction. We must dissect the agglutinated and altered texture of the cicatrix. In most cases we require to transplant skin to fill up the gap, and in doing so we must be careful to keep flaps of sufficient thickness and avoid twisting, dragging, or anything likely to interfere with their vascular supply.

There is always a risk of a very large or long flap losing its vitality, either in whole or part, and hence I often prefer two or more smaller flaps of skin, so that their nutrition may be less imperilled.

## LECTURE XXXIV.

Tetanus, a Result of Wounds and Injuries—Time of its Invasion—Symptoms—Pathology—Treatment.

HAVING now considered the various forms of wounds and their treatment, we come to examine the nature of TETANUS, one of their most formidable consequences. This disease is evidently one commencing in the nervous system, affecting the muscles secondarily, and is characterised by violent and persistent, or at least long-continued, contractions of the muscular system.

Although most frequently the result of injury, it occasionally occurs without obvious cause, and hence it is classified under the heads of Traumatic and Idiopathic Tetanus. It is with the former that we, as surgeons, have principally to do.

Traumatic tetanus may result from any injury; for although it is most likely to follow laceration, or when nerves are injured in punctured wounds; it occasionally occurs after an incised wound or a trifling abrasion, especially in warm climates and during the rainy season. In this country tetanus generally occurs in spring or at the end of autumn, when the weather is wet and changeable.

In cases of traumatic tetanus the symptoms rarely appear immediately after the injury; generally from eight to ten days afterwards; sometimes, when the healing process is nearly completed. One of the worst cases of tetanus I have seen commenced in this way: The patient had suffered from a burn on the arm, for which he attended my ward at the Infirmary as an out-patient. Some time afterwards, when the burn was almost cicatrised, he was seized with tetanus. He was taken into hospital, and treated in the manner presently to be described, and, I am happy to say, recovered. There is usually a short pre-

WOUNDS.

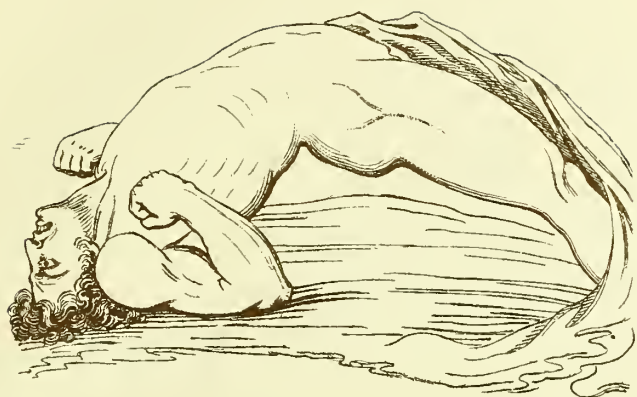


Fig. 1.

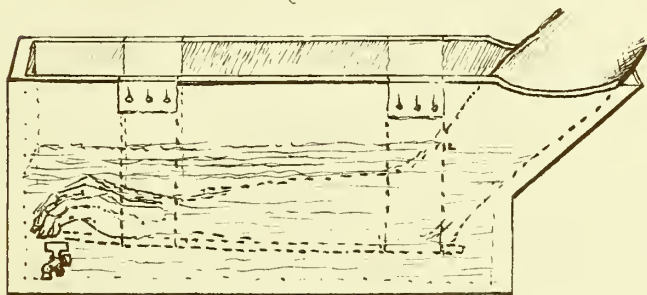


Fig. 2.



Fig. 3.





monitory stage, but it is often so slight as not to attract attention ; there is a feeling of some uneasiness and stiffness about the neck and face, which the patient perhaps attributes to the effects of cold. He next feels increased stiffness about the same parts, with twitching pains. The features have a peculiar expression ; the facial muscles are more pronounced ; the eyeballs are more prominent, although the eyes appear smaller from approximation of the eyelids ; the lips seem thin and drawn inwards, the mouth being sometimes twisted to one side ; these appearances are, however, subject to exceptional variations ; the jaws get gradually stiffer till the patient becomes unable to open his mouth ; there is a constant painful contraction of the masseters ; while during the attack the muscles are rigid as iron. This condition lasts for a time, and then passes off, but soon returns—the intervals between the attacks always getting shorter, and the paroxysms becoming more severe and more marked. The head is bent to one side or backwards ; there is sometimes pain over the abdomen and in the limbs, till at last the whole muscles of the body, or a system of muscles, are involved. In some cases the flexor muscles are affected, the body is bent backwards, giving rise to opisthotonos ; or the muscles on the anterior aspect of the thorax and abdomen may become rigid, and the body is then bent slightly forwards, causing emprosthotonos, but this condition is neither so marked nor so common as opisthotonos. There is also a peculiar pain extending from the ensiform cartilage towards the spine, accompanied with great difficulty of breathing—a condition due apparently to spasm of the diaphragm. In fatal cases the patient may die gradually exhausted, but more generally he dies from asphyxia during one of the spasms of the diaphragm and intercostal muscles. Sometimes, in a very early stage, the patient finds it almost impossible to swallow, especially hot or cold fluids, as these stimulate the throat, and lead to the paroxysms. This symptom might make us think the case to be one of hydrophobia, but the other symptoms can scarcely be mistaken.

We know very little about the general pathology of tetanus. In the traumatic form we have the lesion of the superficial nerves giving rise to irritation in the nervous centres, and these reacting upon the muscles. In many cases we find the injured nerve inflamed, the neurilemma more vascular than usual, and irritated at the injured point, and we infer that the excitement of the distal part of the nerve has led to the disease of the nervous centre. The post-mortem appearances in tetanus are similar to those of all spasmodic or convulsive diseases: there is engorgement of the veins about the spine, depending on active congestion of the part; and there is always more or less serous effusion; but these conditions may be produced by the very symptoms which preceded death—the spasms and convulsions. There is seldom much irritation of the mucous membranes, or internal congestion of organs, except the nervous system, though in some cases the great vessels of the lungs are congested. The distinctive appearances of the disease are, the irritation of the nerves injured, which are inflamed and irritable for some little distance upwards, and also the congestion and increased vascularity of the medulla spinalis, and especially the congested condition of the rachidian veins.

TREATMENT OF TETANUS.—The first thing to be done is to allay the irritation, and to get rid of the exciting cause by removal of any foreign body which may be present—by the division of partially divided or torn filaments of nerves, as in lacerated wounds—by making a clean incision round the torn part, or by amputating the limb if it be not too late. After any foreign body has been removed, poultices, either simple, or medicated with solutions of tobacco or opium, or warm anodyne fomentations may be applied, or the injured limb slung in the warm-water bath, which may be medicated with opium or tobacco.

At one time the number of infants who died in the West Indies from trismus or lock-jaw was very great, and on examination it was found that the midwives attending the mother during confinement used to apply remedies of their own to the cord of the infant, which led to great irritation, but when these were

done away with and soft poultices applied, the number of deaths was greatly diminished.

Besides removing the source of irritation, we must also use active measures towards relieving the congestion of the spinal marrow and its membranes, which leads to muscular spasms. For this purpose, cupping along the course of the spine may be resorted to : where the patient is robust and healthy we may use the wet-cupping, but when much depletion cannot be borne the dry-cupping should be employed. The use of warm fomentations, and rubbing in the extract of belladonna with some mercurial ointment and opium along the spine, will be of benefit. Internal remedies are also to be given, such as opiates, and specific remedies, such as the *cannabis indica*, which acts as a sedative, but still maintains the force of the pulse without increasing its frequency. Whether we give opium or *cannabis indica*, one point to be attended to is, that the medicine should not be given in a solid, but in some easily diffusible form. Large quantities of opium are given in tetanus without producing any effect, and after death it has been found undigested in the stomach. This shows that the medicine ought to be given in a liquid and not in the solid form. By some opium is supposed to produce congestion and excitement of spinal cord, and to be on these accounts objectionable. The best method of exhibiting the *cannabis indica* is to drop the tincture on a little raw sugar, as the resin becomes concrete if we mix it with water. In many cases we find that, by introducing a tube into the rectum, by which the vapour of the *cannabis indica* may be injected as it were, the system becomes very readily affected ; and this is specially useful when the patient cannot swallow from the trismus being complete. Various other remedies have been proposed ; among them calomel and opium are generally resorted to. Mercurial preparations are sometimes rubbed over the spine and groin ; but I have never seen any good effects produced by these remedies. The alkaloid curarine, the active principle of the woorara poison, has been used as a subcutaneous injection, but with little success. The Calabar bean, in doses of

from one to six grains, has also been administered in a few cases.

In most cases the bowels are obstinately constipated, and the use of active purgatives is requisite. As there is often even at first a difficulty in swallowing, the use of croton oil in a little mucilage will be found the most manageable form.

It is stated by some writers that retention of urine occurs in consequence of spasm at the neck of the bladder; but although I have treated many cases of tetanus, I have never seen this condition, but usually the opposite, from the contractions of the detrusor urinæ.

Ice to the spine or cold affusion is often very beneficial in relieving the spasms for a time; the patient should be placed in a bath, and cold water dashed upon the spine and back, but this, like other remedies, gradually loses its power. Warm affusion and the warm bath have long been used, but the patient cannot be kept for any great length of time in the bath. Chloroform given internally, and also by inhalation, checks the convulsive spasms, and when combined with *cannabis indica* often affords great relief. But after all, when once the disease has gone a certain length, it gets beyond our control, and our remedies can do little good.

If the exciting cause of the tetanus be a wounded limb, ought we to amputate and so remove the source of the irritation? I have done so myself in some cases; but I never saw any benefit derived from it. If the part injured be a finger only, and if the operation be performed at the very first, before the symptoms have made any great progress, the result may be favourable; but after the disease has progressed—when the trismus and spasms have become marked—or when the disease has passed beyond stiffness in the neck and difficulty in swallowing, then amputation will do no good, as by that time the disease has been propagated to the nervous centres. In the larger amputations the patient often suffers from the effect of the operation, and the symptoms of tetanus become more marked and more severe than they were before the amputation. In

cases where recovery takes place very great care is requisite as to diet and regimen during convalescence, avoidance of all excitement or exposure to cold or draughts of cold air. In many cases, however, it is wonderful how rapidly the patient recovers when once convalescence sets in.















